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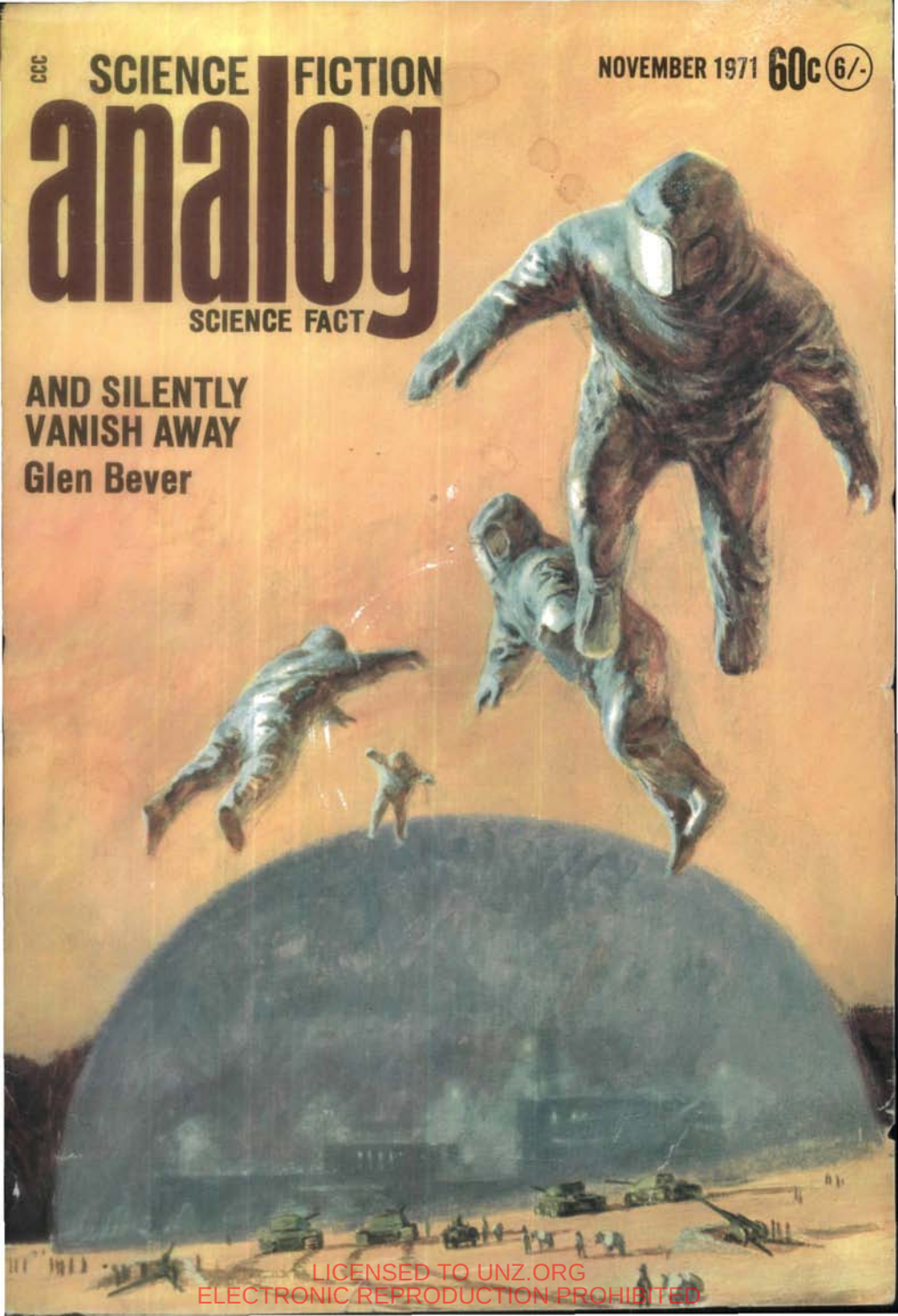
AND SILENTLY VANISH AWAY

Glen Bever



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THE GORED OX

an editorial by John W Campbell

[illegible] set off by the recent publication of various secret government [illegible] been analyzed, preached [illegible] and flowed over. This amount [illegible] generated enormously exceeds the amount of light produced.

[illegible] will seem to be some points [illegible] been touched on by the [illegible] to the magnificently *ostrich* attitudes shown [illegible] such items as publication [illegible] stolen FBI files, cheers [illegible] 'Wonderful!' and the [illegible] Pentagon Report [illegible] the Free Press [illegible] of those [illegible] papers after their elected [illegible] government [illegible] that the validity [illegible] planned without such [illegible] considered.

[illegible] agent steals the [illegible] files and proves their [illegible] business throws that [illegible] court! The court of [illegible] right to [illegible] stolen data, even if it does happen to be true!

Stealing and publishing the FBI files is a great idea—three cheers for the sneak-thief who did the noble act! It's a *good* thing because the stolen material shows the FBI was gathering data that was mere rumor and speculation, and wasn't proper data, and that was proven by publishing it publicly.

Actually, of course, newspapers that had known all of that data for years weren't able to publish it because of libel laws; they may have known the facts, but couldn't get legal evidence to prove it, and therefore didn't dare publish it.

But publishing FBI data files is something else; they can claim no responsibility for what the FBI said in their files.

A year or so ago some magnificent Syndicate dirty linen got washed very publicly when a series of FBI bugging tapes was released by court order. One Syndicate member in

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deep trouble in court, partly by reason of data the FBI had found through use of their bugging tapes, demanded through his attorneys that the FBI tapes be made available to him for study. The results were, from the Syndicate's viewpoint, a disaster; it meant that *all* the tapes had to be made part of the legal court record, and therefore public documents.

Now since most of the tapes were made up of assorted Syndicate members gossiping, discussing rumors, and bragging about how much power and influence they had—what government officials they'd bribed or blackmailed into cooperation—the percentage of truth was about what you'd find in the average gossip-factory output.

It certainly loused up the Syndicate's operations—but it was just the sort of thing to ruin the career of a strong, honest politician. The men who can't be bought, and won't yield to pressure, are the ones the crime bosses most want to push; they stand out as the key log in a logjam. Because they won't yield, a lot of other more amenable politicos can heave a sigh and say, "But I *can't* so long as he doesn't!"

Wherefore when boasting about their power and achievements, the juiciest boast is the claim to have pressured, or bought, the tough ones into compliance. After all, it's no boast to say you've bought-out some weakling who sells out to anyone for a few bucks!

But inevitably, any well-running gossip-factory produces a few items of truth; the business of a detective is to collect *all* the statements and suspicions and spiteful claims he can, and then winnow them, cross-check, and search out implied data, until he finds the small percentage of truth that can establish the guilty ones.

Anyone who reads detective stories knows the essence of that business: suspect everyone, listen to anyone's comments, consider all possibilities, and derive the truth from the bits and pieces that come mixed with unreliable, untruthful, and totally irrelevant data. Three of the possible killers won't reveal where they were at the crucial time; it's a good bet all three are innocent of the killing, but you've got to pry out the data somehow. So one of 'em was busy cheating on his wife, who owns all the money in the family. One of 'em just happened to be busy helping two associates rob a jewelry store in the city. And the third was equally busy about nonpublic business which had nothing whatever to do with the murder case, but which the public has no right to know.

Now be it noted that the public's *desire* to know *does not* establish any *right* to know. None whatsoever. Just because you're nosy, and have a violent curiosity, and think it's important, doesn't mean that you have a right to pry into other people's private affairs.

That is a point which many liberals and press people have a total in-

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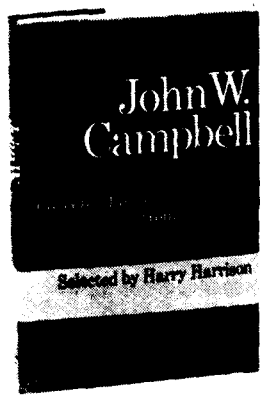

...ate. The fact that ... something stab- ... minds ... at to ... of the press ... cans ... use any information ... way, legal or illegal, ... right because they ... know.

... If Jack Ruby hadn't ... the nation the great favor of ... Oswald dead, there was ... danger we'd have ... with the interesting situ- ... the President's assassin ... have walked out of court a ... and untouchable man. Thanks ... work of the free press, the lib- ... dens, and the remarkably in- ... petent district attorney in Dallas, ... there was, of course, a tre- mendous howling, hammering, screaming demand for news about the case—not only the United States, but all the rest of the world wanted to know. The pressure of the world press beating down on a relatively small-town midwestern police force and district attorney, did not help their use of sound judgment.

They cooperated with the press. They gave out so much news, so much data, information, and discussion of what was going on, and what was believed to have happened, that there is great doubt that Oswald could ever have been brought to trial. There had been so much public discussion of both evidence and speculation that com-

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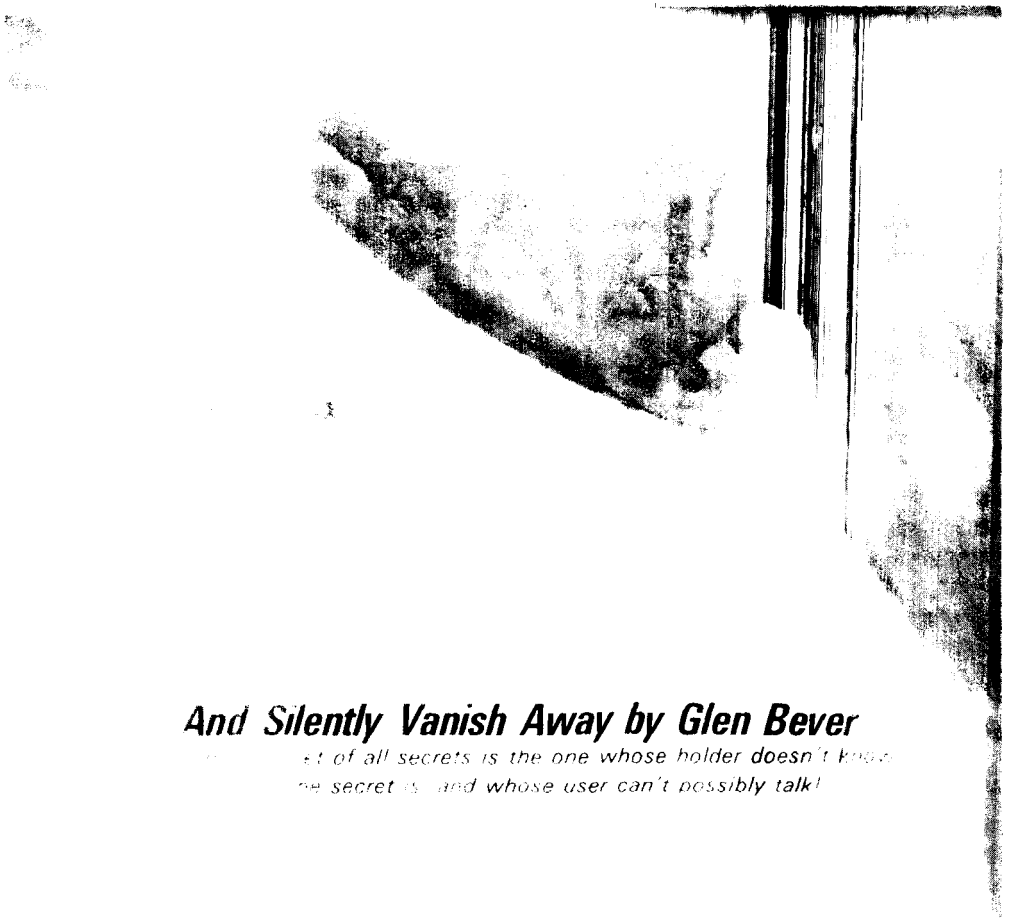

And Silently Vanish Away by Glen Bever

t of all secrets is the one whose holder doesn't kno
e secret is and whose user can't possibly talk!

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I

The escaped white rats were growing steadily bolder. This one waited, crouched in a corner of the office on the avocado green carpet, until Killeen's hand closed convulsively about it before vanishing with a disdainful squeak. Too late he thought about putting on the brakes, as all six and a half feet of his powerful frame crashed into that same corner. A moment later the office com-web chimed and his secretary said rapidly, "Pete, there's an Algernon Pratt out here, from the Department of Internal Security. He looks very important, very busy, and he wants to see you immediately!"

The president of Shamrock Biochemicals arose, a bit more slowly than when he was on the right side of forty, and groaned loudly. "What, another one so soon? Lord, the supply is inexhaustible! All right, Jane, stall him . . . conference, I guess . . . until I signal. And if any rats drop in, just pretend that you don't see them." Miss Morrissey agreed dubiously and broke the connection. Killeen was worried himself: it was a calculated risk to keep the DIS man waiting. He wanted his latest unwelcome visitor so angry as to be incoherent in the upcoming discussion. Yet, if one of the teleporting rats suddenly appeared in Pratt's lap, all hell would be let out for noon.

When the man waddled into the inner office a carefully-timed quarter of an hour later, Killeen's hunch was confirmed. Pratt was cut from the standard bureaucrat's mold, self-importantly pear-shaped. The period of cooling his heels in the outer office had created a pronounced temperature differential between them and his collar. Killeen proceeded to turn up the heat. "Good morning, Mr. Pruitt!"

"Pratt!" he replied in a snappish tenor.

"Of course. Your business with me?"

"It has come to our attention in the Department of Internal Security," he began portentously, "that certain, uh, developments crucial to the, uh, national interest have arisen in your laboratories." Killeen grunted amiably, signaling the fat man to continue. Pratt looked sly. "Now, by some oversight, we have not yet received your preliminary report on, uh, the matter. My predecessors apparently failed to explain the, uh, situation to you. *I* am merely here to ask when we may expect your report."

"What report?"

The bureaucrat was aghast. "Why, why, the Item of Potential National Interest Report, Form H-1224-A!"

"Oh, that report. Now what was I supposed to have filed one of these things for, Mr. Proust?"

"Pratt!" he shrilled.

"Of course. But you know, you didn't say exactly what developments—"

The government man looked

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around the mahogany-paneled office and intoned, with stunning originality, "The walls have ears!" Killeen thought this to be improbable, and said so. Pratt snorted. "You know, bugs!"

"*Bugs?*" echoed Killeen, looking bemused.

From there the conversation went rapidly downhill, until Pratt screamed, "Damn it, we know you've got disappearing rats over here!"

His host frowned. "This is bad?"

"They come back, too! And disappear again, and—" He could not go on.

"They teleport, is that it, Mr. Potts?"

"Pratt!"

"Of course." As the silence lengthened the Shamrock president changed tactics. "You don't really *believe* this, do you?" he asked gently, trying to look as reassuring as possible. This was not a complete success, since Killeen's total baldness, except for jet black eyebrows and van Dyke, added the finishing touches to his resemblance to Dan Scratch. "Well, do you?"

"Er, no. Yes. I don't know!"

"I am quite sure," said Killeen, rising out of his chair and rounding the massive desk to tower over his visitor, "that I would be aware of any teleporting rats disrupting my own laboratories." He continued sternly, "I also suggest that you discharge the perpetrator of this crude hoax from your employ at once!" Seizing the unfortunate DIS representative's plump shoulders, Killeen propelled him doorward. "And any time I can do more for you, don't hesitate to call on me, Mr. Prawn!"

Miss Morrissey grabbed the bureaucrat at the suddenly opened door with her usual perfect timing—in her alter ego as the head of Shamrock's legal staff, she monitoried all of Killeen's office conversations not protected by a Privacy Barrier. She applied a come-along hold to the fat man with an efficiency surprising in one so attractive. Accelerating him effortlessly, she kicked the door shut behind his despairing "Pratt!"

"Of course," murmured Killeen.

II

Once Pratt had been safely deposited back outside the Hazard Barrier surrounding Shamrock, Killeen returned to worrying in earnest. Opening the com-web to the outer office, he said, "Jane, get Tom Wu in here, quick like."

Minutes later the company Security chief was ushered in. The stocky Chinese never looked overly pleased with the world, and today was no exception. "Well, Irish, in the four days those miserable rats have been loose, we've run our way up through half a dozen DIS echelons. I figure another twenty-four hours till old Simon Witherspoon himself gets his wind up and claps the lot of us into 'protective custody', never to be heard from again."

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"Twenty-four hours; such a Pollyanna you've become, Tom!" Killeen chuckled. "Speaking of surprise, I certainly never thought I'd be grateful for the triply-bedamned Hazardous Industries Act, but it's saved us thus far. Having to make Shamrock a self-contained community forty miles from nowhere—laughingly known as Jackass Flats, Nevada—has at least kept our problem children close to home. I don't know if rats can teleport through a Barrier, but at least neither they nor anything else can *walk* out!"

Wu nodded dolefully. "Agreed. It's electronic surveillance that has me worried. As you ordered last Tuesday, we tripled the power to the outer Barrier, and jiggered it to block all radiation and trace any signal over a milliwatt, in or out. My men have kept it at full strength ever since, and we've been going crazy tracing electric toothbrushes, sixty-cycle hum, and California radio stations! Although we *have* blocked and eliminated three holographic probes; I think they're getting curious out there. How long we can keep all the snoopers out—" He shrugged.

"You're doing a great job," said Killeen sincerely. "That parade of DIS bureaucrats, festooned with cameras, probes, and recorders, would have been bad news indeed if your people hadn't jammed their gear from the instant they passed the second Barrier in the decontamination lock.

"But I've got some good news: Morrissey convinced a superior court judge that, as company president *cum* board of directors, I have the authority to invoke Title IX of the Act."

"Which says?"

"That's the gem about 'controlling probable public disorders pursuant to an industrial emergency of a chemical or biological nature' and so on, at considerable length. But it means that we can legally keep our Barrier radiation-opaque, at least until Witherspoon can put the screws on a higher court. And furthermore," said Killeen with obvious relish, "you are now empowered to disperse, detain, or otherwise harass anybody within five miles of Shamrock's perimeter."

"With pleasure!" Wu flashed a rare grin and left hurriedly to organize patrols.

III

Killeen then called down to the organic syntheses labs and invited Art Corneil to the office. The source of his present dilemma was a scrawny, nondescript, and quite irreplaceable young man. Corneil had some kind of psi talent for making "impossible" reactions go. A gift, you say? Well, it got him the boot from some of the most prestigious graduate schools and industrial laboratories in the country. When Art was the only one who could reproduce one of his special syntheses, the whispers started. By the fourth or

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[illegible] happened, there was always an assistant dean or a vice president there to say more in sorrow than in anger, of course. "Overall, good work, but it just isn't [illegible]." And off he would go, until that day Killeen had discovered the unbuttered twenty-six year old and signed him to a long-term contract [illegible] agreement which had considerably brightened Art's outlook on life and figured prominently in [illegible] later successes.

"Why don't you look cheerful this morning?" said Killeen, as the [illegible] haired young man walked [illegible] the office and glossed [illegible] ordinary chart. "Progress?"

"No, I'm getting nowhere fast. [illegible] was fixed. I've scattered [illegible] groups of the [illegible] compound, and I could get a [illegible]."

"Is [illegible] virtue [illegible] we've been through [illegible] explaining [illegible] to be [illegible]?"

Art scratched his chin, [illegible] "The one thing I've [illegible] is the [illegible] of the reactants and [illegible] mechanism isn't necessarily that sheet of paper [illegible] formulas which I [illegible] the molecules in [illegible]. He snatched a pebble [illegible] Killeen's desk and sketched a circle, randomly populating it with little A's, B's, and C's. Then he drew another circle neatly divided into thirds, with the A's in one sector, the B's in another, and the C's in the remaining one. "If the structure I'm [illegible] is wrong, I can't quite get a handle on the molecules. Even a tautomeric mixture throws me, until I figure it out. O.K.?"

"Yup. Can you deduce a structure from the, er, 'feel' of the molecules?"

"Don't I wish I could. Handling [illegible] my notebook code for the batch of L40 that makes rats go 'poof' gives me a headache, but no information."

"Don't feel singled out for persecution, Art. The analytical boys are getting severe migraine from the [illegible]. Is there a limit to this 'sorting out' ability?"

"I don't know. I've never tried more than a dozen different species at once, a four-step reaction in the [illegible] flask, but that was easy [illegible]."

Art swallowed ostentatiously, [illegible] his head. "Sorry I asked. [illegible] his telekinesis work with [illegible] objects?"

"You mean, can I split huge [illegible] with a single thought, the [illegible]? No. This is more like it." As he spoke, Killeen's paperweight — a large tarantula embedded in [illegible] high invisible plastic — rose several feet into the air, dived at its startled owner, and returned to the desktop. "Boo!"

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"Thanks, that answers my question. Now, I used to be an organic chemist myself, lo these many years ago, before I was ensnared by the great god paperwork. How about a brief sketch of the reaction you were running when you got 10C?"

"It wasn't anything new, just a repeat of several previous L40 syntheses. Seems it's an excellent antiviral agent—blocks attachment to the mammalian host cell wall or something. I just make whatever the computers over in Statistics tell me to."

Kilieen snorted. "I can remember when regression analysis was an esoteric specialty that nobody took seriously. And considering our present mess, I wish it had stayed that way!"

"Anyway, they'd run out of the stuff down in the animal assay lab and wanted some more. The basic reaction is an isomerization of a tricyclic hydrocarbon, with aluminum chloride as the Lewis acid." He sketched three cyclohexane rings in various conformations, all bound together in the symmetrical, strainless cage of carbon atoms characteristic of the structure of diamond. "Once you have the adamantane skeleton, the tertiary hydrogens are quite labile, and further derivativeness—there, there, there, and there—is easy. I can run the whole sequence in one pot with about ninety-nine percent yield of the final amantadine derivative."

"Say, Art, how does your TK get from product to reactant if you haven't got a mechanism or some route to visualize?"

Corneil grinned. "Damfino. I just gather up the various species in my 'hand' and give them a little twist, *so*—and the flask is full of product. Neither the kinetics nor the thermodynamics of it seems to matter: this knack of mine would give a physical chemist fits!"

"Amen—'but it works!' The engineers' motto. I've got the idea now. No flashes of genius yet, but give me time. Did anything different, no matter how trivial it seemed, happen on the run that produced 10C, but on none of the others?"

"Art's ears reddened slightly. "I hadn't wanted to mention this, Irish, but if it's really serious—"

"You know it is, now 'fess up!"

"All right. As I started that particular run, Dan Worley was just finishing up a sodium fusion at the next bench. And, uh, he told me afterwards that that tall, red-headed secretary from Stat was walking by in the hall. Laura, I think her name is."

"You think correctly," said Killeen.

"I see that her fame—among other things—is spreading. So Dan was watching the retreating 'female form divine' instead of what he was doing: pouring the sodium fusion into the waste crock. And, well, it sort of went astray. As a matter of fact, the stuff went down the drain of the adjacent sink. All I knew at the time was that there was this tremendous

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explosion and then a flash of light!'"

"So that's how that poor, old sink expired!'"

"Uh-huh. Anyway, that blowup scared the [illegible] it scared me quite a bit. And just as I was giving the next-to-last species in the reaction pot that little twist, *so*. I must have jumped three feet straight up, and the twisting went completely out of control. When I landed, the 10C was in the flask, and that's all I know."

"And you can't remember precisely how you diddled that precursor?" asked Killeen, less than hopefully.

"No, not even with the total-recall drugs, or under deep hypnosis. And having people deliberately scare me, on the off chance of producing more teleportation compound, is another Grade A flop. I have to *tell* the person when to pop the paper bag, so it's not all that terrifying when it comes."

"No, I don't suppose it is. Hm-m-m. Will Frazier, over in the analytical labs, tells me that some weird sort of pattern is beginning to emerge from the data on 10C, but he wants more time. He keeps babbling about getting himself committed to the funny farm if he tells anyone else about it!'"

"I know exactly how he feels. But still, I need a structure for 10C to produce more of it. I'll keep trying, but—"

"I know, it's giving you an ulcer. Have you ever considered deducting your yogurt bill from taxes as a business expense?" Corneil snorted and stalked out of the office, leaving the president to admire the pale-blue tie that had suddenly flown up and draped itself tastefully over his right ear. "Remind me not to aggravate that man," he muttered. "It's just not healthy."

IV

The next day Killeen and Miss Morrisey had just finished congratulating themselves on keeping DIS at bay when bad news arrived, carrying a slim, black attaché case. It had been obvious for some little while that not every spy within Shamrock had been muzzled in time. The first teleporting rat had been reported loose at noon Tuesday, but even Killeen's naturally suspicious nature had required several hours to put two and two together and get twenty-two. He had ordered the Hazard Barrier made radiation-opaque by five that evening—producing a most abrupt sunset—and organized a roundup. Tom Wu and his men had spent the next couple of hours gently plucking the company's twelve known spies from their beds and disposing of them in sundry ways legal, untraceable, or both. But someone's calculations had been even faster: witness the parade of Internal Security bureaucrats through his office, attesting to the leak.

Worse yet, reflected Killeen, that unusually bright agent must have had at least two employers. For he

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had talked to many a Washington desk jockey in his day, and the spare, graying man sitting ramrod stiff in the only conventional chair in the office was an entirely different proposition. In spite of the conservative, gray business suit, Killeen had "Mr. Mortimer" pegged as at least a bird colonel in—yes, the Army Chemical Corps was the probable organization. A change in tactics was indicated, since Mortimer was most unlikely to buy the "nobody here but us chickens" routine that had succeeded thus far. "Enough pleasantries, sir. Shall we talk business?"

The man smiled frostily. "Certainly, Dr. Killeen. I am here about your peculiar rats. The ones that have learned to teleport when given a specific batch of a compound you've code-named L40."

"Oh. As simple as that. Then I'll not mince words, either: what does the Army propose to do about it?"

His visitor leaned back with an un-military guffaw. "No secrets at all, eh? Very well; I told those idiots that— But never mind them. Brigadier General Harold Stoner, U. S. Army Chemical Corps, Special Services, at your service. Call me Harry."

"My friends call me 'Irish', among other things. And we *are* going to be friends, I gather?"

"I hope so! It's done my old heart good to see someone outwit Simon Witherspoon's select cadre of spies, extortionists, and thugs—and so elegantly. You've been scrupulously law-abiding, and DIS won't try to nationalize you because of the adverse publicity I'm sure you could generate during the fight. They're not that desperate. Yet."

"I'm surrounded by optimists. But you're right about one thing, a good lawyer is an honest man's only defense these days. My legal staff earns its five percent of my soul! I presume that you've come bearing gifts, like maybe a results-or-else ultimatum for me?"

The general looked uncomfortable. "Well, yes, but I'm just passing it along, yours isn't the only neck on the chopping block in this affair. Special Services received a most explicit order to produce Shamrock's 'secret formula' when we took over from the Internal Security boys."

" . . . Or else! Damn! Harry, I read hundreds of stories like this as a little kid. You know, about the mad scientist brooding in his basement laboratory for twenty years, until he finds a secret formula that converts his pet slime mold into a city-devouring monster. And he always scribbles the formula on the back of an envelope, which is promptly stolen by the bad guys for use in sundry bits of blackmail and worse. The trouble is, the powers that be still *believe* that hogwash, as if $E = mc^2$ is all you need to build an A-bomb!" His indignation came to a sputtering halt. "As I said, what are you going to do about it?"

Stoner's amused look vanished

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abruptly. "As a first step, Irish, I've moved about a thousand of my best men into your back yard for some 'war games.' Shamrock Biochemicals, Inc., is going to quietly disappear from the view of the outside world for a time."

"That wouldn't take much. We saw so little of it before that I only believed in big cities on alternate Fridays."

"Bitter, bitter. For country bumpkins, your people did a most professional job of eliminating your resident spies when this thing broke. We didn't get our man Horton, who sounded the alarm, out of the hospital until yesterday. The chief internist just would not believe that those weird symptoms could disappear so fast. But you've merely postponed the day of reckoning, Irish. A lot of people are going to get hurt, starting with you, unless you divulge how those teleporting rats of yours do it. Now."

Killeen looked at him intently. "Odds enough the only truthful thing I said to that parade of DIS inquisitors was 'I don't know!'" He overrode Stoner's protest. "I mean it! Every man and woman in my labs was worked on nothing else for the last five days. You think we don't realize that these damnable rats are a powder keg with the fuse already lit? Further, we produce a 'secret formula' for them, or Witherspoon and other right-thinking friends will nationalize the company *and us!* Now I don't particularly want to work for Uncle until I'm a hundred and twenty, and—"

"All right, all right! Look, I'm on your side and I'll do my best to give you some breathing room. But as an old Chinese proverb that I just made up says: he who would dance a jig on a mountain path had damn well better know where the edge is. I've got to know what's going on when I talk to my superiors." He pointed to the paper ocean on Killeen's desk. "Shall I start reading those reports?"

The president inspected his visitor carefully, then sighed. "It's a deal, Harry. How about a drink?"

"I thought you'd never ask. Scotch on the rocks, please."

"There's naught but Irish whiskey here!"

"My mistake, Pete; pour when ready!" The tension dissolved and the two of them got down to work.

V

The biological experiments were clear enough. The best route for administration of the 10C was intravenous, but even oral intake was effective after a lag period. The critical dosage seemed to be 50 mg/kg body weight/day for about three days. Much more of the compound and all the rats disappeared; much less and they all remained in their cages. Unfortunately, this establishing of "teleportation dosages" had resulted in another four dozen white rats joining their brethren cavorting about Shamrock's halls.

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Unfortunately, because rats just beginning to teleport posed a special hazard. Their "aim" was not the most accurate in their first few tries, and the more animals testing their new-found ability, the more accidents. One rat had appeared inside a giant distillation column full of DMF vapor. Another had arrived at a point two feet above some high-voltage circuitry, fallen into it, and started a nasty fire. But other rats had been re-captured, unconscious but still intact, and kept immobilized by heavy sedation. Dissection revealed no major morphological changes in teleporting, as opposed to normal, animals. The physiologists were just as baffled as the anatomists—a rat which is doped to the gills is not an ideal subject. The biochemists were not talking to anyone just yet.

Killeen was not talking either, at least not about the aspect of the dosage experiments that bothered him most. As Lisa Hobbs had explained it to him several days before, one of the biggest, healthiest rats given 10C had teleported once—for a second or two, before re-appearing in his cage and expiring five minutes later in acute shock. "It was really strange," she had said. "The animal seemed almost delirious for a few minutes; then he slipped into a catatonic trance and died. An autopsy showed absolutely nothing wrong with him, except for a slight inflammation of the brain tissues. Weird. I just don't understand it."

Killeen did not either, but he definitely disliked it.

Meanwhile, the analytical chemists were having a nervous breakdown. They had used up the unprecedented quantity of four grams of Corneil's product in an unsuccessful attempt to elucidate its structure. So much of the compound had been consumed in so many analyses because no two of them came out the same.

The first real indication of trouble came when ten successive elemental analyses (for C, H, O, N, and S) on the same instrument gave ten different empirical formulae. Each formula resembled the "correct" one for the amantadine derivative L40, but with some portion of the molecule gone, missing, simply not there; a different portion on each determination, regrettably. Several other machines gave the same sort of data, varying from run to run; but they worked perfectly for any other compound than 10C.

Coming at once to the conclusion that the teleportation material was, in fact, a curious mixture of isomers, they attacked it with a dozen different breeds of chromatography. A routine thin-layer separation gave rise to a large, sinister-looking blob spread over a third of the plate. Gas chromatography produced a single, sloppy curve instead of a series of sharp peaks. And so on.

Undeterred, the spectroscopists joined the fray. Identification of functional group absorptions in the

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infrared was hampered by unpredictable constantly changing shifts in their wavelengths. Insofar as a pattern existed, a different chunk of the "theoretical" molecule seemed to be responsible for each spectrum. Visible and ultraviolet spectra were [illegible] odd. The NMR spectrum proved to be a useless hash even when a sample was held at liquid helium temperatures, any given peak was seen to split and coalesce again [illegible] seconds. Those mass spectra which did not have too many peaks had too few, and they were all in the [illegible] places anyway.

A single isolated sample of 10C [illegible] optical activity on Wednesday, a huge positive rotation on [illegible] and none again on Friday. [illegible] of common and exotic techniques applied and experiments performed over and over ran to fifty [illegible] without establishing [illegible]

[illegible] was not particularly [illegible] with Frazier bent of [illegible] literally pounding [illegible] at six the next [illegible] reluctantly awake. [illegible] you to respect [illegible] When the racket [illegible] the door and [illegible] just because I'm [illegible] and have to [illegible] of the rug.

[illegible] Frazier was a deep- [illegible] who was uncomfortable [illegible] under- [illegible] Hugo's aversion to being [illegible] "What's your companion in martyrdom over there?"

Killeen glanced at the corner indicated, where Stoner had propped himself up and was listening attentively. Once introductions had been made, and Frazier had adjusted to the idea of being surrounded by the U. S. Army, the president said, "All right. Will, what's so urgent in the middle of the night?"

"We've got the structure of Corneil's compound 10C. In, uh, four dimensions."

"Oh. Oh, no! How?"

"Ask Art." Frazier shrugged.

"I fully intend to. But how—Why—What did *you* do?"

"Personally, nothing. I merely delegated authority, sometimes known as passing the buck, to another department. I gave all the data we'd amassed to one of the bright young lads over in Statistics, told him to program a computer to analyze it, and waited. It seems that the kid didn't know that it was impossible, so he took the machine's 4-D answer at face value. He even developed an appropriate nomenclature, and the wildest looking three-dimensional representation of the structure you'd ever want to see! And by God, he's right—it's the only answer that fits everything together."

"It would be. What did I ever do to deserve . . . no, never mind, I remember now." Killeen pondered the neat ball-and-stick molecular model that Frazier held out. It looked perfectly normal, except that some of the bonds didn't seem to connect

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with anything at the other end, and various bonds were different colors, and some of the atoms had been cut in half, or even in thirds– "Take it away! In fact, I suggest that you take it to Art and tell him I want a carload of the stuff by midnight."

"Right."

As Frazier was leaving, Jane Morrissey craned her head around the door jamb and said softly, "Message for the general, Irish."

Stoner jumped up, looked accusingly at Killeen, and sagged back against the wall. "How does she know who I am?" he demanded.

"Relax, Harry. Yon carrot-top is also the head of the legal staff you admire so. She *runs* this company; I'm just a figurehead! Besides, everybody and his dog will know that the Army has landed in a few hours– Shamrock is no metropolis! Toss it here, Jane."

Stoner took the message capsule and placed the coder-bulb to his eye for a retinal pattern check, then twisted the device open and spilled the tape onto the carpet. He scooped it up, read it, and began to curse quietly. "Pete, there's been another leak, almost surely in the Washington DIS office. Anyway, the Soviets now know as much about your rats as D.C. does, and they're equally convinced that you people are holding out on them. So you can bet that the entire Russian espionage network in North America is going to converge on this singularly God-forsaken desert in short order. Which will ensure the presence of an equal number of Internal Security agents to 'protect' Shamrock. If you thought you had snoopers before, you're going to be up to your nonexistent hairline in them nowV"

VI

At first, the presence of about ninety Russian agents, uniformly disguised as dirty, old uranium prospectors, reminded Killeen strongly of Gilbert and Sullivan. The resemblance was even greater when some hundred-odd DIS agents arrived, uniformly disguised as–of course– dirty, old uranium prospectors. Stoner did yeoman duty to keep both sets of spies too busy to do any spying. Whenever an electronic surveillance station was almost operational, he would send out a patrol armed with large signs bearing appropriate insignia–the skull-and-crossbones, or a radiation trefoil, or "U. S. Army Maneuvers, Unauthorized Personnel KEEP OUT!"–to chase the intruders away posthaste. Several smoke-laying squads were on call at all times: "invisible" corporals equipped with infrared sensors made off with great quantities of Russian and American hardware under cover of billowing, black clouds. Straying helicopters spooked burros. Canisters of itching gas were mysteriously misdirected, further plaguing men already *sans* soap.

It almost worked. Tom Wu's gigantic Privacy Barrier handled even

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fewer probes than before. They were undone by a nonminiaturized transistorless probe known as a newspaper reporter. Stoner brought the morning edition of the Reno paper into the office personally. "Feast your eyes on this, Irish!"

"Feast is one word," said Killeen absently, scanning the page before him.

SOMETHING FISHY IN THE DESERT?

By Melvin Farquardt

Strange things are afoot at Shamrock Biochemicals, the bastion of our nation's defenses against the scourge of chemical and biological warfare. Except of course when they're fighting nationalization, as they have three times in the last ten years. And now, Irish!" Killeen is back in the story, as Mrs. Murphy's chowder again.

Shamrock certainly made a lot of news recently. His plant is [illegible] by some one thousand men of a hush-hush project for the Army Chemical [illegible] brought there for "war games" [illegible] twelve hours now. And the county seat at Jacksonville has been busy, too. They have issued a grand total of 212 Mineral Resources Prospecting Permits in the last week, as opposed to exactly *three* in the preceding year.

Killeen doesn't seem to be overly anxious to meet all his new-found friends, because the high-powered Hazard Barrier around Shamrock has been sealed as tightly as the proverbial drum for—you guessed it—the last week. And this isn't just any old Barrier. It has been specially modified from the inside to help any nosy neighbors out there in the desert mind their own business. This reporter purchased a small laser probe at a camera shop, trekked out to the sight of the festivities, and tried to look through this Barrier—to see if, for example, all the buildings were still there. About a tenth of a second later, my brand-new apparatus was a blob of smoldering circuitry. My hands are still in bandages as I dictate this.

Since then I have talked with various county, state, and federal authorities about this burning affair. To a man, they disclaim any knowledge of, any interest in, and any desire to investigate the strange goings-on at Shamrock. Who has clamped the lid on? And on what? *What has got loose out there in the desert?*

"This is just great!" snorted Killeen, throwing the newspaper onto the desk in disgust. "We'd better get ready for the avalanche of phone calls and sensation seekers—"

"There won't be any," said Stoner gluinly.

"Repeat that?"

"I said, there won't be any. The Secretary of the Army thought he'd quashed the story, but it had already got out on the national wire. Half the

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country must have heard about you by now; that's the only reason that the Secretary let this be published.

"The President has ordered fifty thousand counter-insurgency troops into this area—we've been under martial law since four this morning. The surrounding four hundred square miles have been cordoned off until the Army can erect its own Barrier, and all your outside communications have been diverted into a military switchboard. Air cover is being provided from Colorado Springs temporarily—" He trailed off, looking more depressed than before.

"Why so gloomy?" asked Killeen. "Sure, it's bad for Shamrock, but it should at least make your job easier."

The general shook his head. "Point one, it's not my job any longer. Witherspoon got to the President, and DIS is back in charge. Their administrator, Scargle or something, will arrive this afternoon. Point two, this thing has got so big that a coordinated effort will be impossible. But point three is the worst. DIS and, I regret to say, the U.S. Army have taken the opportunity provided by the government's brand of martial law to jail every last one of those Soviet agents."

"So we lose our comic relief; we'll manage."

"Irish, use your head for something beside keeping your ears apart! As long as the Russians thought that they had a fighting chance of pirating your 'secret' by espionage, they also wanted to hush it up. Now they have nothing to lose: the missile-rattling should start any day now."

Killeen looked skeptical, until Stoner added, "They're scared clear through, and I don't blame them. The very thought of a teleporting Soviet Army overrunning the United States terrifies *me*—and the Russians have been particularly sensitive to even the hint of an invasion since that little unpleasantness with China a while back. Technological superiority or no, the only thing that saved the U.S.S.R. that time was the Chinese lack of mobility. So now we've got a ring of frightened enemies, each with a big, red button. Pretty soon your rats may not be the only species to do a disappearing act, Pete."

There did not seem to be much to say to that.

VII

Killeen had a premonition that the arrival of one Jonas J. Scargle was not a cause for rejoicing. At the very least, it spelled the end of their privacy, and he had plans to get under way before meeting his public. He decided that a visit to the biochemists' lair was first on the agenda.

Lisa Hobbs was staring dubiously at a blackboard full of cryptic squiggles when he arrived, and it required no more than the offer of a cup of coffee to pry her out of the lab. Once ensconced in the cafeteria

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[illegible] bugs of the [illegible] brew before them. The cook originally in charge of coffee had been deported during the great spy roundup; the little, round blonde became positively o-[illegible]

"A week, slumping legions of [illegible] at 100C at all sorts of [illegible] different ways, and [illegible] animals at regular [illegible] now, one week after [illegible] back to the [illegible] started with [illegible] up another [illegible] results this sort of [illegible] ing kg body [illegible] every six hours until [illegible] appears [illegible] hours. But sooner or [illegible] veil out of them!"

[illegible] been doing."

[illegible] "But why haven't [illegible] in the miserable [illegible] last few days? It's a [illegible] more efficient over before. [illegible] understand it does a [illegible] around the animal quarters [illegible] them."

"No such luck, the little beasties [illegible] right through it. But we recover them shortly afterward. In a fit of genius, I thought of implanting timed release anesthetic capsules under their skins before the experiment. So every hour or two we go around and gather up slumbering rats in a big basket! They aren't very adventurous at first, and a circle of maybe five hundred yards in diameter catches most of them." She looked around and lowered her voice. "The ones that die don't ever get out of the room."

"Oh-oh. How many?"

"Two more cases just this morning, Pete. They teleport, come back very close to their starting point in shock or something, and die from—brain inflammation? They act almost as if something had driven them literally insane, if the term means anything where a rat is concerned. Anyway, about one percent of the animals tested expire that way."

Sleen looked bemused. "Any other, um, side effects?"

"None. It's ridiculous: either the treated animal is bright, healthy, and energetic or he's stone cold dead. We can't predict which in advance, except on a statistical basis, which is a big help!"

"Right. The last I heard, the physiologists were wailing and screaming imprecations because the only time they could experiment on a live, teleporting rat was when he was so sedated that their results were worthless. Have they—"

"Nope," Lisa interrupted. "They're as frustrated as ever. Wilbur had just finished giving a preteleporting rat a complete physical—EKG, EEG, the works—and pronounced it completely normal when it vanished out of his hand!"

"Hm-m-m. And has a single animal had the common decency to disappear with a popping noise? No. *Something* must fill the space they

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vacate before the surrounding air can rush into it, but what?"

"We now think that it's the air at the other end of the, uh, tunnel? After all, two molecules of anything aren't supposed to be able to occupy the same space at the same time without a considerable BANG resulting. And a rat plus half a liter of air in the same space simultaneously should be good for at least a small explosion! So we experimented. When you drop a pre-teleporting rat with a lead weight around its neck into a tank of water, it sinks to the bottom, vanishes, and an air bubble of equal size rises to the surface. I rest my case."

"And to think, I was ready to nominate you for membership in the Solipsists' Club. Too bad. Is there any earthshaking news from the anatomists? Dead rats don't teleport, I hope?" Killeen asked anxiously.

"They do not. But the boys still can't find any morphological changes associated with 10C treatment, even in the central nervous system. The CNS is our best candidate for where the ability resides: large chunks of cerebrum and cerebellum become metabolically very active during 10C treatment. First they synthesize new, rapidly labeled RNA, probably messenger. About twenty minutes later, the cells produce the first of the new proteins, probably enzymes.

"It sounds to this amateur as though Art's compound triggers an inducible enzyme system or something," opined the president.

"Doesn't it just? If you put a tritium label on a stable part of the molecule—one that doesn't flip into the fourth dimension periodically—you can follow the passage of the radioactivity through the body: most of it promptly binds to the DNA of cells in a few specific, 'unused' regions of the brain. And there it stays, presumably bound to the operator portion of the teleportation genome. I figure that psi abilities somehow got linked to 4-D molecules way back when they were plentiful on the planet."

Killeen nodded. "And as the molecules 'decayed' and became rare, those inborn talents stayed dormant in more and more people. It must have been pretty bad, Lisa: a civilization built on psi would have needed few tools, less transportation—going to work for a living probably destroyed them."

"How can you joke about it?" she exclaimed.

"The Germans called it *Galgenhumor*," he said gently. They sat in silence for a long minute, until Killeen shook off the mood. "It could also have been that the original, limited number of 4-D molecules was eventually spread too thin, what with generation after generation eating off the 'sacred tree' or such. Then only an occasional freak concentration of them gave rise to a 'wild talent'."

"Like Art."

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Killeen jumped as if stung. "Who ... I mean what—"

"Oh, skip it!" she chuckled. "I figured what he was up to some time ago—this affair just confirmed my hunch. But what are you going to do with him now that the heat's really on?"

"How so?"

"Spare me the wide-eyed innocence—on you it looks ridiculous. First of all, I'm pretty sure that Art is the only one who can make more IOC right?"

"To my knowledge," he admitted.

"Second, nobody else is going to be able to synthesize more of the stuff whether you release the correct formula—which would be laughed out of the country—or a phony one. Ergo, they will conclude that you're still holding out on them. And Withspoon will have the lot of us arrested immediately, if not sooner. Right?"

"You're right."

"And third, if you admit that only Art can make more IOC he'll be in a DIS interrogation room three seconds later with the rest of Shamrock as the poker as hostages to entice you into cooperating. Correct?"

"Oh, all counts, Lisa."

"So, how do you propose to—"

"My dear, your analysis of the situation is quite good. But it scarcely matters. The one I am going to see is the illustrious Mr. Scargle at the meeting, subtitled 'Prevention and Profit.' See you at the general meeting!"

"What meeting?" Lisa asked.

"The one I'm going to call in about ten minutes. Bye." He strolled off with a jauntiness he did not altogether feel.

VIII

Killeen disliked the new DIS administrator from the moment that rather long and cadaverous person strode into the office. (Scargle was reputed to be not only twice as smart as his predecessor, the unfortunate Pratt, but five times as arrogant.) Although it was a moot point which *man found the other more* distasteful. At the moment, Killeen was putting up a strenuous argument for dropping the secrecy that Stoner has been forced to impose on Shamrock's operations. ". . . Then at least let us make our Barrier transparent again! Look, Scargle, the balloon has already gone up. Since the Russians made their charges on the floor of the General Assembly, the whole world knows there are teleporting rats in here. And they're just as firmly convinced that we're suppressing the secret of how . . . hell's bells, they're right!" He paused for breath, then added modestly, "Of course, since I'm the only one who seems to be able to make the teleportation compound, Shamrock will be the sole source of supply." Which was an outrageous lie, he thought, but all my people will back me up.

Scargle's gaze swung around and fixed on Killeen's bland, guileless ex-

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pression like antiaircraft radar picking up a target. "The United Nations will be informed in due course of any developments in your research here."

"I'll bet."

"Ahem. But don't you think that you would be, uh, happier continuing your highly important work in the more, uh, stimulating atmosphere of the Department's Washington laboratories, where—"

"No."

"As I was saying, where—"

"As *I* said, no! I stay here."

Scargle restrained himself, taking another tack. "Certainly, Dr. Killeen. But you will naturally wish to send a substantial amount of this 10C compound to Washington for—"

"Nope. One more strike and you're out."

Scargle's visage grew even more granitelike. "Killeen, I can and will impound that material by executive order!"

Killeen chuckled. "No, you can't and won't—but at least you went down swinging. Now then, Scargle, there are a few things you should know about in your, um, profession. For example, a conditioned behavior block?"

"I might," he admitted. A moment later, he sat bolt upright. "Oh!"

Killeen beamed at him. "Precisely. Before your arrival, I took the precaution of having such a block implanted. Implanted so deeply that I am now quite incapable of synthesizing more 10C under duress. Nor can I open the main vault under coercion."

"What has the vault got to do with it?"

"The other source of the teleportation compound, Mr. Scargle! All the 10C in existence is in our main vault, and I am the only person who knows how to open it without blowing up this end of the building, and the material with it. Surely you don't think I would defy your august self without cornering the market, so to speak! The goose that lays the golden eggs is invaluable only so long as it is unique."

"Very funny," said Scargle tightly. "But there are ways to break down those blocks—not very pleasant ones."

"Ah, but such things take time. And if I do not enter a certain computer code every six hours, the vault will blow itself up without any outside assistance."

"How about you?" snarled the Internal Security man. "Do you vaporize into a large pink cloud after twelve hours in a cell?"

"Alas, no. But the synthesis is a complicated operation requiring my full faculties, unclouded by drugs or hypnosis. Can't you get it through your thick head, I produce the stuff voluntarily or not at all! Is that quite clear?"

From the expression on Scargle's face, it was obviously quite clear. "Oh, I understand. Yes indeed, I understand!"

Killeen smiled beatifically, once

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again the compleat innocent. "Besides, whatever do you want the compound for? We have all the facilities necessary for the preliminary animal testing that the FDA requires, up to and including primate work. Why, no 10C will have to leave Shamrock until it's time for human studies in . . . oh, ten years or so. Don't you agree?" The bureaucrat gritted his teeth, said nothing. Killeen continued smoothly. "Now, should you wish to bring certain particularly well-qualified scientists *here* to study this puzzling phenomenon with us, I'm sure that we could accommodate another fifteen or twenty persons. Naturally the Department will wish to support their efforts with a modest amount of additional equipment and funds—"

"Naturally." After a bit more of the one-sided haggling, the fuming DIS representative stalked out. Game and set to Killeen; but the match was far from over.

Getting Lisa Hobbs on the comweb, he asked about the progress of the primate experiments she was conducting behind a Privacy Barrier in an obscure corner of the animal room. He hung up scowling: out of fifteen rhesus monkeys that had been induced to teleport, one had already died in the same puzzling manner as the brain-damaged rats.

IX

The first of the Department of Internal Security's selected experts arrived early the next morning. During the night, the Army had completed a second Barrier completely surrounding Shamrock, and energized it to the same radiation-opaque state as the existing one, over Killeen's strenuous objections. "Even threatening to flush the stockpiled 10C didn't budge Scargle," he told Tom Wu sadly. "He is obsessed with secrecy. But at least he's given us his most gracious permission to open a full-size gate in *our* Barrier. Poor Harry had acquired a real loathing of suiting up to cycle through the decon locks every time he wanted to talk to me!"

Within an hour of the "open jail door" policy, as Miss Morrissey called it, the rivulet of scientists, soldiers, and politicians entering Shamrock became a stream, then a flood. With them came carloads of specialized equipment not already present, weird manifestations of the scientist-engineer's knack at work. As Security chief, Wu tried valiantly to monitor and inspect all the incoming hardware, until angrily told to desist by a DIS flunky. He was disposed to fight until Killeen took him aside and said, "Tom, I want that equipment inside our labs exactly the way it arrives. This is important! Now can you keep your boys from snooping around in those cases?"

"I suppose so, but—would it do any good to ask why?"

"None at all."

Wu shrugged and dropped the subject.

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The politician's knack, or lack of one, was meanwhile being displayed in the United Nations. The Soviet Union had drummed up nearly unanimous support for a resolution declaring the secret of teleportation to be the rightful property of the peoples of the world, and demand-

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immediate surrender to the
custodianship. The United
is the only nation to the Se-
caught up on its fines.

invoked a 1977 amendment to the Charter for the first time and vetoed the proposal. The remaining nations of the Security Council promptly

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paid up. Then they all joined to veto the American veto, precipitating an organizational crisis. Whether the ensuing, vociferous debate was settling anything was a moot point. Killeen had hoped that it might buy them more time—until Stoner, who brought them all their news since the second Barrier had gone up around them, informed him that the Russians had just mobilized another million men of the Revolutionary Popular Guard.

Stoner was spending more and more time in Killeen's office, and not just because he had found another circular-board chess player. "I may as well act the messenger boy," he groused. "There are so many brass out there, fresh from D.C., all fighting to get their names on record as saving the country from godless Communism and teleporting rats, that a lowly brigadier gets lost in the glare. Besides, the country is going to hell in a chrome-plated handbasket!"

For while the rest of the world was distilling its fears into a war frenzy, the American lunatic fringe had charged out of the woodwork with whoops of joy and a thousand, different "new, improved secret formulas for teleporting man or beast—mind you, sir, all this for a mere three fifty a pint!" Toy manufacturers, advertising agencies, quickie churches, numberless others climbed aboard the psi bandwagon. There was even a Miss Topless Teleport in, of course, Southern California. Gone was the bitter aftermath of the Lordsburg anthrax incident: biochemical laboratories were now the very apple of the nation's eye. Shamrock's local edition of the Air Defense Command was so busy chasing away sight-seeing private planes and helicopters that they would not have noticed a Soviet attack until it landed on the roof.

In spite of a dizzying whirl of such images, Killeen finally dozed off lying on his office carpet. Some time early the next morning, he was shaken back to consciousness by an unprecedentedly agitated Tom Wu. "Wake up, Irish, please wake up! Someone has driven a channel right through the Army Barrier to the outside!"

Killeen opened one jaundiced eye. "Who? From where? And what's on it?"

"We don't know yet. The source is somewhere inside the labs, but shielded. Damn well shielded, to punch through a Barrier and not leak enough energy for our detectors to spot it. I've got four groups tracing it now, but it may take ten or twenty minutes before— You old scoundrel, you're smiling! Who's the canary this time?"

Killeen gulped ostentatiously and patted his stomach. "Jonas Scargle—delicious! Operation Can Opener is proceeding according to plan, so let's just relax. Want a drink while we wait?"

Tom wrinkled his nose. "No,

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thanks, I never drink before six."

"Well, neither do I. But I'm very seldom up before six thirty anyway." He ducked the report flung at his head, and continued mixing a whiskey and orange juice. "Tom, I probably could have kept those visiting firemen out of here. But I wanted them inside the project, with full access to all correction, almost all of our data. I imagine you'll find the communications apparatus built into one or more of the newly delivered pieces of equipment—because at least one of those 'consulting experts' is a Soviet agent. DIS wanted to keep our work here secret, whether or no it touched off World War III. I merely allowed Scargle's own ineptitude at picking our assistants to blow the cork off!"

Wu nodded slowly. "Very neat. Almost Machiavellian."

"Why thank you!" Killeen laughed. "Coming from the inscrutable Orient, that's quite a compliment." After discussing the matter for a few more minutes, the Security chief left to attend to the spy roundup. The agent had served his purpose of puncturing the shell of secrecy, and this *faux pas* should be still another lever to apply to the recidivant Jonas Scargle.

"Pete, I'm confused!" said Morrissey plaintively. She stepped into the inner office, still clad in a pair of clinging emerald green pajamas. Killeen was not the only one who had taken to sleeping in an office; he merely complained more loudly than most.)

He glanced up at her briefly, then repeated his inspection with unwonted appreciation. "I tend to forget," he reflected, "that my awesomely efficient secretary is undeniably female." At a well-built six feet tall, Morrissey was one of those women who was only now, in her early thirties, coming into full blossom. Killeen dragged his thoughts back to more businesslike channels with an effort. "Huh?"

"I don't understand all this fuss. I thought *nothing* could get through an opaque Barrier?"

"Well, Jane, there's nothing, and then again there's other nothing—" He stopped, with the distinct impression that he was not making sense.

Morrissey confirmed the feeling. "Run that by again?" She stretched vigorously in the pneumochair she had taken, straining the buttons of the pajama top.

The distracted Killeen took a long gulp of his drink. This is ridiculous, he told himself crossly. Jane has been working for me for six years and has never affected me like this before. Although, he noted thoughtfully, her present kittenish behavior was very much out of character. And that smile—was she deliberately *trying* to – His pounding pulse slowed and he grinned wolfishly at her. "Excuse me. Point One, any Barrier is completely impermeable to matter, even to projectiles at .9999 of light speed. Clear?"

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"Clear." She sounded faintly disappointed.

"Point Two, any Barrier is completely permeable to any form of energy which is *not* part of the electromagnetic spectrum. Point Three, a normal Hazard Barrier is E-M in nature, and will pass any energy which *is* electromagnetic in nature. Understood?"

"Uh-huh. Why don't you be a gentleman and offer me a sip of that?"

"What makes you think I'm a gentleman?" he leered pleasantly, rising to mix another whiskey and orange juice.

"What makes you think I think so?" She changed the subject again before he could reply. "I even understand Point Four: a Privacy Barrier is just a regular one that's been rendered opaque to all E-M energy, including sunlight. That's why we've been living in Gloom City for weeks—streetlights just aren't the same."

"Amen." He handed her the drink, then leaned against the wall next to her chair. "But if you're so smart, what's your question?"

"Just this: how did those spies get a signal out through the U.S. Army's giant Privacy Barrier?"

"Why the engineers again, Jane. The blackboard physicists have since shown that, to a first approximation, it's impossible to transmit energy through an opaque Barrier. But a graduate student named Jake Ballou didn't know that—and found that if a sufficiently high energy flux impinges on one side of such a Barrier, some of it goes through! Not much, and the law of diminishing returns governs that. If one part in a million gets through at one energy, one part in 10^{12} gets through at double the incident energy. This gets to the point where a large fusion bomb exploding on top of an opaque Barrier does no more harm to those under it than give them a suntan."

Morrissey smiled ruefully. "Maybe we could arrange for one, Irish? There isn't a UV lamp suitable for skin in this whole place, and I haven't seen the sun in ages. Why you can barely see my bikini lines any more," she added, undoing a couple of buttons so that he could, indeed, see.

Killeen braced himself more firmly against the wall. "Anyway, our inquisitive visitors had a hot enough rig to achieve the Ballou Transmission Effect. And in this game, a milliwatt is as good as a sandwich board." He was babbling again, he knew. "Now go back to sleep!" he said, lifting her out of the pneumochair and slapping her smartly on the bottom. She beat a hasty retreat, a triumphant grin on her face. Rather than consider the implications of that smile, he lay back down on the carpet and went to sleep. Or at least pretended. "Women!" he muttered.

X

By that afternoon a number of the

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labs were a mess. Tom Wu and his men had conscientiously dismantled every new piece of equipment within the Shamrock Barrier, looking for transmitters and other, more unpleasant surprises. Scargle had outdone himself: three of his eleven hand-picked experts had been involved in sundry nefarious deeds the night before. One of them, a neurologist named Pomeroy, was no longer among the living. He had tried to open the main vault to get at the 100 stockpile, and had blown himself into very small bits at the first of the three doors. The second door was not lightly scratched, but the surrounding room was demolished.

Of the other two, a biochemist named Larson had doubled as the electronics expert, expert enough to keep a multi-channel beam punched through the Army's opaque Barrier for a full five minutes. "Which was," noted Wu, "plenty long enough for that rig of his to broadcast everything we know or even guess about teleportation. Which he was doubtless doing. Irish, you succeeded royally there."

Killeen assented. "But it seems now that it was a risky stunt, after all. I'm still not sure what that cytologist named Lewis was up to, but I suspect it had to do with those odd components you found scattered through several instrument cases. Did you recognize them?"

Frankly, no."

"Neither did I, but Harry identified them right away. He said that those parts could be assembled into a small neutron bomb that would kill anyone without an opaque Barrier between him and the bomb. Without harming any equipment or materials. Just guess what somebody had in mind! Cheery thought."

The military was embarrassed and showed it. The Internal Security people were also embarrassed, and showed it by becoming twice as belligerent as before. A conversation with Scargle was typically ridiculous. "My Lord, man!" Killeen exclaimed. "The Kremlin undoubtedly knows everything worth knowing, and a lot that isn't, about our operation here. Why make even bigger fools of ourselves by keeping the Barrier opaque, pretending that we're going to solve the problem in the next twenty-four hours? It's asinine!"

Scargle pursed his lips even more tightly. His entire head had retreated into his archaically starched collar, creating a striking resemblance to a snapping turtle. "The national security would not be served by such an action."

Around and around they went, as in a caucus race, until Killeen had heard so much about "preserving national security" that *dé jà vu* was setting in. "Jonas, old boy," he inquired, "do you have a Privacy Barrier around your house?"

"Why, yes. But why—"

"That's good." Killeen smiled venomously. "Because I'd hate to think of you showering in lead B.V.D.'s to protect state secrets!"

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But once the bureaucrat was gone, a worried president was back on the com-web, speaking urgently to Lisa Hobbs.

XI

Two days later it happened. One of the disorderly stacks of paper that cluttered up Killeen's desk of late shifted and began sliding. Which in itself would hardly have qualified as a disaster, were it not for the glass of twelve-year-old Irish whiskey perched precariously atop the stack. He reached out and caught the glass halfway to the floor—then almost dropped it again when he realized that both his hands were still on top of the desk, and that the glass was obligingly hanging in mid air. "By all the saints, it worked," he breathed. "With telekinesis as a bonus—but who'd notice TK in a rat?" The glass rose smoothly into the air again, firmly in the grip of his immaterial fist. Belatedly he remembered the newly instituted DIS patrols in Shamrock's corridors, and activated his Privacy Barrier.

Then he sat back, marveling at the seemingly unassisted grace with which the glass moved about. "It—honestly—worked!" He had not really believed that it would, and had cursed himself as ten kinds of fool each time he had injected the sterile 10C solution into his vein—a man in biochemical work should know better than to be his own guinea pig. But he had persevered, and now experimented with increasing enthusiasm, determining the limits of his telekinetic strength and dexterity.

But in the midst of juggling four heavy books in an intricate pattern, his glee dissolved into a heartfelt sigh. "Well, there's no time like the present. Or so they say," he observed dubiously. Putting visions of catatonic monkeys firmly, albeit not too successfully, out of his mind, he picked out a spot across the room and concentrated on getting from here to there.

There seemed to be two routes open to him. Either he could simply walk across the intervening ten feet of carpet, or he could—what? He could—sense a bypass, a tunnel *around* the direct and obvious path. But there was something very odd about the—inside of the tunnel, a glowing something that twisted and squirmed so that he could not quite pin it down. He leaned forward, peering at it intently, and suddenly found himself inside.

He looked around in surprise. "Look" still seemed to be the correct word, even though he could not find his body; bodies did not seem to fit into the scheme of things in this—place. The most striking characteristic of the space around/within Killeen was the abundance of peculiar shapes and figures flowing by, erratically borne along on the currents of opalescent blue light. Such as that triangle, formed by two straight lines that ran parallel, which he somehow

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knew indicated the way back to his office. It could not be a triangle; yet he knew with complete certainty that it was, but it could not be—

Suppressing a rising panic, he examined another figure. It was obviously a square, in spite of the unequal angles at which the seven curves that composed it intersected. It just could not be— Now he knew what had happened to the dead rats and monkeys. When the sensory input to an adult organism directly contradicts everything it has ever learned about the deadly serious business of survival, something has to give way. The animal avoids the contradictions by ceasing to think, to perceive, and finally to live. The fear that had settled into where Killeen's stomach used to be began to spread outward as his mind raced in futile circles

Abruptly he decided to get out of the shining tunnel without delay. He fixed his attention on that impossible triangle that led back to the desk, but found that he could not concentrate on it, could not accept its existence for the fraction of a second necessary to propel himself back to his office. The harder he tried to grasp it, the more elusive it became. It was only when the panic crested and began tugging and dragging at his mind that the answer struck him, with the force of a blow. *Why* did he need to accept that damnable geometric figure? Because it was his signpost, a tool he needed to get out of here. A tool such as any engineer would use and devil take the theory behind it—just so long as it worked!

Gladly abandoning his attempts to unscrew the inscrutable, Killeen found that he could provisionally accept that circle over there, despite the three right angles in it, as showing the way to his original destination. It was still impossible, and he knew it, but it did not matter for his purposes. He moved toward it—and he was standing on his office carpet, ten feet from the desk. Killeen looked around, closed his eyes, and fainted.

XII

Three days later a council of war was assembled in Killeen's inner office. He counted heads—Corneil, Frazier, Stoner, Wu, Hobbs, and an in-no-way-reformed Morrissey—and activated the Privacy Barrier. "The Secret Seven are now in session!" he proclaimed, only half in jest. With Killeen's determined assistance, each of the other six had received the 10C treatment and survived the initial exercise of their new talents. Art Corneil had come the closest to an irretrievable tailspin in the alternate space, since he had teleported by accident some twelve hours earlier than expected. By then, debate over whether the dosage should have been decreased for someone already psi sensitive was academic; Art had pulled through on his own.

Killeen began. "Harry, do you have any inside dope on what DIS is

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up to? Scargle has been slinking around all day with a malevolent smile on his ugly face, and it's made me feel internally insecure."

Stoner shrugged. "Something is definitely brewing, but the Army isn't in on it."

Tom Wu hesitated, then said, "I hadn't really believed this, but there's a rumor that Simon Witherspoon himself arrived here about three this morning. Incognito, but my informant says he'd know him anywhere."

"That does it." The president rose from his desk and began to pace, covering the twenty feet from one wall to the other in a few impatient strides. "It appears that we have only hours, rather than days, left—and I'm not about to abandon the rest of our people to Internal Security's less than tender mercies. Besides, this place will be an ideal center of operations later, when we get ready for mass distribution of the psi compound."

"Assuming we want to," Lisa muttered.

"What was that?"

"Nothing important. Go ahead."

Killeen looked at her troubled expression for a moment more, shrugged, and continued. "As I see it, when Witherspoon makes his move, he'll have two main targets: the 10C in the main vault, and my own lovable self."

"Say, that's right!" Frazier exclaimed. "Since we've all practically lived behind Privacy Barriers for the last few days, DIS still doesn't know that any one of us can make more of Art's compound."

"Exactly," said Killeen, not altogether cheerfully. "I'm the cheese for this particular trap. Tom, I want you to check out and arm the computer for Contingency 14. Have it key on me, with the code sentence to be—'Simon Witherspoon is a lovable old man.' I won't say *that* by accident! The rest of you, when the com-web sounds Emergency Alert, will have exactly one second to teleport into a prepared biological isolation garment. A BIG is the only protection against the knockout gas we're going to flood the entire Shamrock complex with—our own Barrier is going up just before the fireworks start—and I don't want to truss up all those slumbering goons by myself. Clear?"

It was. They scattered to prepare their escape routes.

Some forty minutes later, back in the inner office, Killeen was telling Morrissey: "Jane, I'm not going to pull the plug on Witherspoon unless he forces my hand. Maybe I can provoke him into spilling some of the government's plans. This could be a mite dangerous, so I think you'd better go now."

"Go where, Dr. Killeen?" asked the Director of Internal Security from the doorway. As the president's gaze flickered to the desk com-web, the little man laughed without humor. "Don't blame your Security

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force for sleeping on the job. They are all under arrest, as is the remainder of your uncooperative establishment."

"And now you've captured the master criminal himself, and his devious henchwoman," observed Morrissey sourly. Under the circumstances, the little man's rabbity appearance was incapable of intimidating her. Thrusting out her hands, she snapped, "Bring on the cuffs, copper!"

"That will hardly be necessary." The director stepped aside and a dozen very large, very businesslike young men in conservative, gray suits filed into the office. Moments later they filed back out, having surrounded Killeen and Morrissey with the blind efficiency of a ravenous amoeba. And off they went, the two prisoners walking in ostentatious lockstep, to the amusement of no one but themselves.

"Tell me, Simon," said Killeen amiably, "what do you expect to gain from all this cops-and-robbers silliness?"

Witherspoon again showed his mirthless smile. "At the moment, the world's entire supply of that chemical of yours; shortly thereafter, a reasonable facsimile of absolute power."

"You don't mince words, do you now? I'll grant that adding teleportation to your other talents for extortion, murder, and worse, would enable you to take over the government tomorrow. But your brave new regime would get flattened the day after by the Russians and Chinese, among others."

"I said 'a reasonable facsimile', Dr. Killeen. I have certain . . . contacts in other countries, who also have a stake in this little venture. I trust we will get along *quite* well."

"Yes, I suppose you would."

Five silent minutes later, the cortege pulled up before the newly repaired outer door to the main vault. "Open it," Witherspoon directed.

"You don't beat around the proverbial bush, either, do you, Simon?" asked Killeen jocularly.

"Go to hell!" The Internal Security director signaled unobtrusively to one of his men, who twisted Morrissey's arm behind her back viciously. A second later the bruiser was on the floor. He surged back to his feet as two other men grabbed the big redhead's arms to immobilize her.

Killeen was not quite sure what happened next. Three more men had intercepted his outraged charge to Morrissey's side, and they had all gone down in a pile. That loud CRACK was two crew-cut skulls colliding as she stepped out of the way, and that OOMPH was associated with Morrissey planting both feet firmly in the pit of someone's stomach. Killeen did not wait to see any further carnage. He pried a hand off his face and bellowed "Simon Witherspoon is a lovable old man!"

The computer's audio pickup in the hallway must have sorted the key phrase out of the general uproar in

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the hallway, for a moment later a piercing siren, of constantly rising pitch, battered their eardrums. Morrissey vanished just as a blackjack passed through the former location of her head. Killeen tarried just long enough to plant a fist squarely in the middle of Witherspoon's expression of savage glee. *"That* was for Jane!" He vanished.

XIII

Another conference had convened in Killeen's inner office, with the addition of a somewhat bruised, extremely annoyed Simon Witherspoon. "Why did you bring that bum up here?" asked Lisa, during one of their prisoner's sullen silences.

"This may sound silly," said Killeen, "but I thought he'd add a touch of the real world to our deliberations. We know intellectually that Shamrock is under siege, but a sense of urgency is hard to come by, reclining on one's duff sipping whiskey."

"You'll never get away with this!" snarled Witherspoon. "It's criminal, it's treasonous, it's–"

"And what you were planning wasn't?" Killeen looked over to the desk where Stoner was quietly dictating something; the autotyper was turning it out as he spoke. "Harry, this is hardly the time to begin your memoirs."

"No, it's not. I'm not."

Frazier cleared his throat self-consciously. "Irish, that's–What I mean is, it's–"

"What he means," said Stoner calmly, gathering up the papers and looking for a pen, "is that I'm resigning from the United States Army. Today." He scratched his signature onto the four copies, then threw them down on the desk with a violence that belied his composed appearance.

Killeen was stunned. "But why?"

"Irish, you're a devious soul, but you just don't understand the military mind–at least not the stage that's ossified in brass. Maybe it's too direct for you."

"Thanks for the compliment, but you still haven't told me why."

"Bear with me." Stoner puffed his briar pipe alight. "Consider our situation as it looks from the outside. We have holed up in Shamrock, having captured and maybe killed a few hundred of their people, and defied the U.S. Government. We have all the psi compound, and all the capability for synthesizing it. As far as the Joint Chiefs are concerned, we've appropriated a vital national resource which should be under their control."

"Damn right! And furthermore–" Witherspoon began.

"Patriotic fervor from *you*? I'm talking about honest, if misdirected, men. We are genuine, certified traitors to them, which to their minds is synonymous with treason to the country itself. And what's the first thing that traitors do? They defect to the enemy."

The general gave a melancholy

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smile. "Have you ever noticed? When a man comes over to our side, he's a refugee. When he goes over to their side, he's a defector and worse. Anyway, the military and the remaining Internal Security boys will immediately urge, and eventually get, a pre-emptive attack. It will involve throwing everything we've got against everybody of whom they're the least bit suspicious, to knock them out before the 'teleporting hordes' can overrun America."

Killeen nodded slowly. "I get the idea. Even for the small portion of the populace protected by Barriers, an all-out thermonuclear and CBW attack on a country would be the end. We've *got* to find some way of pulling the teeth of those weapons before—But why are you resigning?"

"Because I'm going into the dental extraction business," Stoner replied with forced cheerfulness. "There aren't going to be any pre-emptive wars, by the United States or anyone else, Pete. I'm going to teleport to Washington in a few moments and deliver my resignation to the Secretary of the Army personally. Let's just say that I'm old-fashioned—my conscience will rest more easily if I give up my commission before I start committing sabotage on a grand scale!" He vanished.

Baffled, Killeen looked over to where Tom Wu had spread out an armful of what looked like flow charts on the rug. "Look at these, Irish, you, too, Jane. Stoner has plotted a campaign to minimize the coming unpleasantness. In about ten minutes, he'll be riffling through every top secret file in D.C.

"I don't know whether you've tried this, but Harry found that he could remain in the alternate space of the tunnel and still inspect *and operate on* things in the real world! Within a few feet, anyway. The ultimate in spying technique, right? And as soon as he finishes in Washington, he's going to Moscow."

Morrissey looked suitably impressed. "But—Harry can't read Russian, can he?"

"Fluently," Tom assured her. "His Mandarin is better than mine; he can also read Hebrew and Swahili. And as he said, any offensive capability not pin-pointed in intelligence reports in one of those languages isn't worth worrying about."

"I do believe," said Killeen, "that I've underestimated the—ex-general again."

"That's just the beginning!" Art added. "We'd all better catch some shut-eye now, because when Harry gets back— Well, he estimated that it would take all seven of us working separately about thirty straight hours to sabotage most of the means of mass destruction around."

"But our TK just isn't that strong!" the president objected. "We can't teleport missiles right out of their submarines, or even lift just the warheads, assuming we had something to do with them afterward."

"Precisely. In most Oriental forms of unarmed combat, one uses the op-

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ponent's strength against him. We must also operate from weakness, turning the very power and complexity of our opponents' weaponry against them. Do you have any idea how easily—and, more important to us, indetectably—a Barrier generator can be rigged to blow up upon activation? Move a certain piece of tungsten alloy the approximate size and shape of a fingernail paring not more than two millimeters to one side, and when the power goes on—blooey!"

The point having been made, they disbanded to attempt sleep. Wu escorted the still grumbling Witherspoon back to his improvised cell, leaving Killeen and Morrissey alone. "You really think we can pull this off, Pete?" she asked, fatigue blurring her voice.

"We'd better," he told her gently. "For everyone's sake, we'd better." His arm went around her slumped shoulders, and it struck him how small and helpless she looked. "Not too reassuring, am I?"

"Oh, but you are," she whispered in his ear. "You are."

XIV

It was three in the morning when Killeen reached his forty-first and final target, in one of the more isolated corners of the American Sonoran desert. Locations fifty miles from nowhere, he reflected, seemed to be an occupational hazard. For this underground installation was a small, unmanned storage depot containing not more than 1,800 large cylinders of a particularly nasty psychotomimetic gas, with minimal laboratory facilities attached. He was getting steadily better at locating places by coordinates alone: his very first "tunnel" opened onto one of the storage vaults at floor level. Rank after rank of deadly, green-painted cylinders rose toward the ceiling his perception could not reach from within the alternate space; the vault must be more than ten feet high.

Shrugging aside morbid thoughts—the place reminded him of a mausoleum—he reached for the first gas container with his mental "hand". Deftly, he jammed the valve control head beyond repair, and checked to make sure that his sabotage was indetectable. It was, and he moved down the line. As he worked, Killeen wished for the hundredth time that he did not have to operate from the tunnel. It would have been so much simpler to just plant both feet firmly on the floor— The memory of Russian bullets whizzing past his ears dissuaded him. Even automated installations could defend themselves against a normal prowler.

Forty-five minutes later, he found that he was the last one to return to Shamrock. They were all exhausted, but no one felt like going to sleep just yet: steak and champagne were the order of the morning. Morrissey hung back while the others greeted Killeen, then bussed him enthusias-

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tically. To cover his reaction to the kiss, he attacked an inch-thick porterhouse with great vigor. When it failed to moo after being speared by a fork, he settled down to appeasing his long neglected stomach.

"Strangest thing," he mumbled, "the Air Force hasn't got a thing stronger than nitro, but they're still pounding away at the Barrier."

"I think they're just having a temper tantrum," said Morrissey, between sips from the glass floating obligingly before her.

"Wouldn't you?" asked Stoner dryly. "A tantrum is a common reaction to feelings of frustration and impotence. Just think how upset the political powers-that-be are going to get when we start commandeering the mass media to educate people in advance of universal distribution of the psi compound."

"Amen!" said Killeen. "They'll probably all die of apoplexy and that unloved feeling before this is over."

Lisa Hobbs looked troubled, despite four glasses of bubbly. "I know you two are only half serious, but that's the sort of thing that worries me about this whole business. Regaining the psi powers will be a tremendous thing for mankind in general. But somehow the little guy always gets lost in the great movements of history, the ant objecting to the steamroller of Progress. What does it get him?"

"Squashed," said Killeen.

"Damn right it does. The transition to a new social order, if order is the word, will be as bloody and chaotic as anything history has ever seen. By flooding the world with Art's compound, we will effectively be sentencing millions of people to an early death."

"But no one will *have* to take the pills," Corneil argued.

"I don't think that's quite the sort of fatality that Lisa has in mind," observed Will Frazier. "The threat to life and property posed by a teleporting criminal would be very much greater than presently. Universal psi, like the rain, falleth on the just and the unjust alike."

Killeen shook his head. "Nay, not so. You're assuming that the good and the evil, if I may use such terms, will profit equally from the compound. But I doubt it will work that way. What is the minimum requirement for coming to terms with that—dimension? The ability to *adapt*. The teleporter must be philosophically flexible, to coin such a phrase. That's why a man like Simon Witherspoon will never be able to teleport: inconsistency, variability, the utterly new and incomprehensible—these are deadly threats to his only reason for existing, the exercise of power over his fellow men. His obsession with control won't *permit* him to learn psi!"

Stoner chuckled. "See what a chip off the Blarney Stone in a man's gall bladder will do for his oratory? But Pete's right. I for one don't think that Witherspoon will survive his first encounter with the alternate space of

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the tunnel. But he'll try, he must. The power inherent in the ability is too great not to tempt him into trying–he'll be unable to help himself."

"Exactly," said Killeen with mock solemnity. "Although he'll never rest in peace; I hear that Satan is shorthanded. But does that put us on the side of the angels?"

"I believe it does," said the former general. "At least we're sidestepping the thorny question, *quis custodiet ipsos custodes?*"

" 'Who shall keep the keepers?' I'm not that literary, but you're right," said Corneil. "Pretty soon we will have achieved the goal of the ages: let every man go to hell in his own private handbasket!"

Killeen overrode Lisa's protest. "Oh, I know that the idea of pure science, of knowledge disseminated for its own sake, is long out of style. But even one as socially obtuse as myself knows that man has got to have an exit from this poor old planet, or die. If pollution and overpopulation don't kill him, simple stagnation will!"

Stoner cut in quickly. "And psi *is* a way out. As you know, I was once stationed at Moonbase 2. I had no trouble returning there this afternoon to disarm some warheads. I have the coordinates right here, if someone else would like to–"

All doubts forgotten, Lisa snatched the scrap of paper, frowned fiercely at it, and vanished. She reappeared, vanished, came back–again and again, looking more annoyed each time, until finally she sank into a pneumochair and uttered a string of uncharacteristic expletives. "I can't *find* the damn thing!" she sputtered. "When my tunnel didn't open onto solid rock, it opened onto empty space! Coordinates like 11643.97 just don't mean anything to my poor, addled brain. Harry, how do you fix on them?"

Stoner looked surprised. "Well, I . . . er, I don't. I just concentrate on the place itself." He walked over to her, offered her his hand, and they both vanished. A few minutes later, they returned. Lisa's awed expression left no doubt that the trip had been successful. "Next?"

Stoner led each of the others through the procedure, except for Morrissey, who declined his invitation with a half-smile. This done, his thoughts turned further outward. "Let's see– If we can get some of those high acceleration nuclear probes fitted out with memorized *places* in them, and program them for planet seeking– Right! We should be able to start colonizing at least a couple other star systems within twenty years. See you later, gang; I've got to talk to some people!" He vanished.

Killeen rose and walked slowly and deliberately over to where Morrissey sat, still half-smiling. Neither of them noticed that they were suddenly alone. "The Earth is almost full. Would you like to see it?"

"Yes, I would–with you." They vanished together. ■

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Robert Chilson
Compulsion Worse Confounded

The trouble with faultless logic is
that it's completely irrational.

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Raleigh put on his brightest Tuesday-morning smile, resolutely ignoring the throb in his eyeballs that coincided with the morning-after pain in his head. Stepping into the hub office, he called out, "Hello there!" with real pleasure.

Lariann Davis was not at her desk. He caught a growl that sounded like "go to bed," but it might have been "soak your head."

She was washing her contacts in the basin in one corner of the office and didn't look around. One glance at her desk, with every trouble light glowing red, was enough to tell Raleigh that the week was beginning normally. The desk's intercom was on.

"Alvin?" came Addleton's voice from it.

"Right with you," Raleigh told him.

Lariann flashed him a warning look from eyes red-rimmed with anger and tears. He couldn't tell which was uppermost at the moment.

Sighing, he crossed the office, walked down the narrow corridor, and into Addleton's office by the back door. It was a magnificent place, half as big as all the production offices put together. Addleton, president and general manager of Wilder & Wilder Inc., was a hulking big man with a bald head and Mark Twain eyebrows. Except for him, the only thing in the quietly luxurious office that seemed out of place was a picture of a garish package of the company's principal product, Perfek-Pak Foods.

"She's done it again," growled Addleton. "The Archimage is sulking. What do you think of our chances of taking over Mo-Kan Food Factories?"

Raleigh took a moment to untangle these subjects. Finally he said, "Just about nil, I'd say, though it's a good idea. Mo-Kan doesn't actually synthesize food, does it? We really need a merger with some good farming company—that's if it's not too big."

"That's right. Synthetic food, except simple stuff like sugar, is still pretty expensive. All the big farm companies are building pilot plants, though. We're ahead of the competition at the moment, but they're closing fast. Now the Archimage says we can take Mo-Kan. And I have evidence that Mo-Kan is going into synthesis, too."

"They're kind of small for that, aren't they?"

"Yes. But they're starting slow, beginning with bacteria, yeast, algae, and so on. They were among the early farm companies to go in for algae culture, at first for cattle fodder. God knows how far they've gone."

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"Well, I've never known the Archimage to be wrong," Raleigh mused.

Addleton gave him a piercing look. "Oh, no?"

He flushed. "Now, look, that wasn't the Archimage's fault. Neither was—"

Addleton cut him off. "O.K., you're the cybernetician. If you say the machine wasn't at fault, then it must've been the program. Now tell me where the error in the program is this time."

Raleigh hesitated. "Have you told the Archimage what you know about McKan's synthesis venture?"

"Yes. That's when it told me to start getting ready to drop the noose around their necks."

The men looked at each other.

"What were its exact words?" asked Raleigh.

Addleton punched buttons on his desk and the visiplate lit up with glowing letters floating in three dimensions before a murky fog. "Prepare to meet them and make them yours. Take $26 million. Fire Lariann Davis."

"Cryptic as an instruction card in a board game," observed Raleigh.

"Or an oracle's advice."

"Why Lariann?" he asked anxiously.

Addleton gave him his Mark-Twain-rebuking-the-nations look again. "It's got a thing about her. You should know."

As Business Manager of Wilder & Wilder Inc., the Archimage was his responsibility. "It has complained before, but it's never gone this far."

"Well, get this mess straightened out. Find out what she does to it. I've got work to do. At least the com circuits are still clear."

Automation had totally eliminated paperwork, though not red tape. Front offices no longer needed secretaries and receptionists, much less file clerks—assuming the exec knew how to punch buttons and get results. With the office computer "sulking," therefore, Addleton was unable even to read reports. Fortunately he could still hold conferences on the visiphone.

There was still a need for secretaries, filing, and so on, but so deeply had the robot revolution bitten into society that now one girl in a hub office, never seen by visitors, served half a dozen executives. Addleton always maintained that only the computers had saved the world from bureaucracy; he could remember a time when office-workers were increasing at a rate from three to four times that of production workers.

Lariann was not in her office. Raleigh looked at her desk. It told him no more than she would have.

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His office adjoined the hub office. Beyond was the canteen. A number of his co-workers were there, vice presidents and unit managers. He looked in wistfully, not seeing Lariann. They were telling dirty jokes and didn't notice him. He backed out. None of them would be able to go to work until he untangled the Archimage.

In his office, one wall was lit up almost solidly with red lights. He sat down, saying, "What's she been asking you now, O Grand Wizer?"

The Archimage didn't respond; it wasn't fitted with vocoders. After a moment's thought Raleigh spoke into his vocoscribe. "Read back your last instructions" appeared in front of the desk's visiplate. He checked it automatically for logical self-consistency, and fed it into the Archimage.

The machine promptly responded. "That is secret information. Identify yourself. That information is not to be released in this office. Go to the desk in the hub office."

Raleigh rose up behind his desk, fists clenched, gasping for breath. He stared at the visiplate. Then, sitting down heavily, he cleared the 'plate and said, sharply, "I am Alvin Raleigh, Business Manager of Wilder & Wilder." He hesitated, appalled; the machine had no read-ins for any kind of identification check. Would it take his word?

He had already fed in the statement. The Archimage printed, "The information you requested cannot be released to Alvin Raleigh. We are sorry."

For a moment Raleigh was derailed by that "we"; the Archimage was a system of seven computers. Then he placed it as the standard reply to requests that could not be filled.

Lariann was sitting at her desk, pretending to work. Unusually, none of the other men were in the hub office; they'd read the signs. She gave him a defiant look that covered a hint of fear.

"Just *what,*" he asked her, "did you tell the Archimage to do? And whatever possessed you to tell it not to give out information? Are you trying to wreck the company?"

She lifted her chin and Raleigh realized he should have begun more sympathetically. "That's none of your business."

"So I gathered," he told her dryly. "At least the Archimage seemed to think so." He looked at her a moment. She looked unhappily, but stubbornly, away. "You know what it thinks of you?"

That jarred her.

"It's told Addleton to fire you."

Lariann swung wide, startled eyes to him.

"Did you know that you've tied up every desk in the company and that not a lick of work is being done?"

She shook her head. "I just asked it for some advice, like I always do," she said unhappily. "It said it didn't have sufficient information to an-

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swer, like always, so I told it to go ahead and give me an approximation. It did, only it hasn't had time to answer yet."

Raleigh started. "It's still computing, then?"

A quick study of the board in his office had not told him much; a computer system is so complex that no board can give more than a vague idea of what's going on inside. He had concluded that, as before, the machine had been given a conflicting set of impossible orders that would take hours to untangle. So complex a system—managing every detail of the company's business second by second around the clock—could not just be shut down and cleared.

"What did you ask it this time?"

Lariann flushed a beautiful shell-pink except around her eyes, shook her head stubbornly.

Raleigh sighed. "All right. Apparently it's not as bad as I'd feared. It'll listen to you. Tell it to play back its last instructions. When it has done so, tell it to cancel them. I'll take it from there. And don't ever pull that stunt again. Managing the Archimage is my business; if it stops taking orders from me, I'll be out."

She flashed him an apprehensive look and nodded reluctantly.

After ten minutes or so the board began to turn green, slowly. Whatever she'd asked it to compute had tied up every circuit not actually in use in directing operations in Wilder & Wilder's factories, warehouses, shipping centers, and so on. He'd have to check everything carefully to make sure none of those operations had been slacked.

Enough circuits were available now to check on its advice. Raleigh asked for the data on which its advice to Addleton was based. After a minute or so, quite a long time, it flashed a series of numbers; reports in the files. He punched them out and got instant replies; that part of the system was clear already.

The first report was an order from Mo-Kan Food Factories, Inc., for ten tons of a certain nitrogen-fixing bacterium, filled two weeks before. As a sideline, Wilder & Wilder produced and sold many microplants; it used them to produce raw materials for food synthesis. And much "synthetic" food was merely processed plankton, algae, or whatever. That was the easiest way to enter the field.

A footnote quoted Addleton to the effect that a friend had let drop Mo-Kan's interest in synthesis while on the golf links.

The next report was an article in a technical magazine, published a good three years ago. One of Wilder & Wilder's research phytogenesists had written it. Raleigh skimmed through it, finally found the name of the same bacterium. It was mentioned in a brief paragraph as a highly-effective nitrogen-fixer with a remarkable output of proteins. On a graph of the outputs of various microplants, this one was far and away

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the best, with nearly double that of the nearest contender.

Proteins are the hardest of all kinds of foods to synthesize. This was undoubtedly an important find; it might very well be what Wilder & Wilder needed to keep ahead of the competition. Why had the Archimage allowed it to be published?

In fact, why weren't they already being pushed out of the field by competitors using their own product? Raleigh was pretty sure that the bacterium wasn't being used in their own vats. He punched for the complete sales record on it, found that, oddly, it wasn't much in demand. Only a few orders had been made, the largest Mo-Kan's. That was obviously a seed stock. The others were lab samples. A few companies had tried it out but hadn't been interested enough to buy seed stock, then. Wilder & Wilder didn't use it. And immediately after Mo-Kan bought a supply, the Archimage predicted that it would go broke and that a mere 26 million would buy the company.

Raleigh demanded the full research report on the bacterium. Its number was on the list the Archimage had given him. He turned directly to the summary and was amazed to read a crisp analysis of a bacterium that was probably the world's record nitrogen-fixer and protein manufacturer, but was worthless because of its habit of blotting up almost any kind of metallic compound that happened to be around—particularly lead, mercury, and arsenic. Since these compounds are not normally found in large quantities in the nutrient vats, the result is not necessarily poisonous, but it would be very difficult and expensive to keep the bacteria from building up sublethal doses over a long enough time. Elaborate inspection would be necessary, and contaminated vats would have to be dumped with all their tons of contents.

Mo-Kan wouldn't have bought seed stock unless they already had their vats prepared, mused Raleigh. At the very least the project would cost them some millions. A thought struck. They wouldn't have built the vats unless they intended to use the bacterium to produce food. There'd shortly be millions of sick customers. Blood tests would show what'd happened, and the resulting publicity and suits would bring Mo-Kan down.

Theoretically the FDA's tests shouldn't let them put it on the market, but they depended mostly on preventive checking. There wouldn't be sufficient metallic compounds in the nutrient to alarm the inspectors—perhaps not even in the finished product. Metallic poisons are cumulative.

It was not surprising that Mo-Kan had made that mistake; no doubt its lab tests were made with very pure nutrients. The other companies that had investigated the bacterium had been more thorough, or luckier.

Still, now that he thought of it, it

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was odd that there weren't more of them. Apparently only a few companies had heard of it. But all big companies subscribed to the technical journals: the data was fed into their computers. Another look at the published report gave a hint; a few punched buttons confirmed it. The journal the report had appeared in was quite a small one. Not a house organ, a cooperative journal published by half-a-dozen companies—one of the largest of which was Mo-Kan Food Factories.

Mo-Kan had been cleverly stabbed in the back.

But not in the dark.

Raleigh walked in on Addleton abstractedly. "It's the cleverest thing I've ever seen," he said.

"The damn thing still isn't satisfied," Addleton told him.

"We're not legally responsible . . . hell, we're not responsible, period."

"Maybe we'll have to move her to some other position. Not responsible for what?"

"For stabbing Mo-Kan in the back. You mean Lariann?"

"Yes, the Archimage is still complaining. Who stabbed Mo-Kan?"

Raleigh stared. "Wasn't this your idea?"

"What?"

Raleigh explained rapidly. Addleton, eyebrows flexing in wonder and intentness, checked the reports himself. Finally he shook his head. "I've never seen anything like it. Must've been a coincidence. I'm tempted to go ahead and take advantage of it, though it's our duty to tell them what's up."

"I guess it is."

Addleton reached for the unicom, began to set it up to telefax a message. "Tell Lariann to break the news to the Archimage. See if you can settle their differences. What's the thing got against her?"

A good question. He stopped at Lariann's desk and passed on the bad word. Back in his office he sat slumped and considered the board, now nearly normal.

He couldn't just ask the computer what it had against the girl.

Wait a minute. The machine had directly advised that she be fired. It didn't often make that kind of recommendation about personnel. It wasn't supposed to be specific, since it had no judgment. Therefore it must have something specific against her.

He phrased the question carefully. The response was immediate.

"Lariann Davis is an enemy saboteur and spy."

If he had not been paralyzed with astonishment, Raleigh would have leaped out of his chair. After a moment he hauled his lower jaw back up and asked hoarsely, "On what data is this conclusion based?"

The Archimage gave him a list of seven "sabotage" attempts, the latest that morning—each an attempt to destroy the effectiveness of the Archimage itself. Three of these attempts had been erased so completely it had

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no idea what the instructions had been. One of them was instructions to maintain a constant projection of future women's clothing styles. One was a request for an analysis of the probability of her being promoted to Office Supervisor and orders for the Archimage to warn her if there were to be any promotions made. One was for it to determine, or deduce, what his—Raleigh's—favorite foods were. The last one was for it to maintain a projection of the probability of his being promoted and to warn her of any high probability.

These were surprising enough, though he'd seen stupider requests put by people who supposedly knew more of computers than Lariann Davis. The Archimage's trepidation was understandable; each of these was an order to set up a constant program. Over the past three months she had been absorbing more and more of the computer's time and circuits for projects that had nothing to do with its basic program.

A computer might complain—if properly programmed it would complain of such treatment—but accuse a person of being a spy?

"What is an enemy?" Raleigh finally asked it numbly.

"Anything that, or anyone who, knowingly and deliberately attempts to prevent, or interfere with, the dominance of Wilder & Wilder, Inc.," the Archimage responded.

Raleigh gurgled, nearly losing his eyeballs as well as his jaw. Shakily and hurriedly he had the entire conversation electrofaxed and all but ran with the paper to Addleton's office.

Fortunately there was no one there but the general manager. He slapped the sheet down on the big desk and dropped into a chair, gasping.

Addleton bent a wondering gaze on him and read the paper intently. His eyebrows almost climbed onto his bare dome. "It sounds like the Chairman of the Board!" he grunted.

"It's out to take over the world!"

Addleton looked at the paper again, his shaggy eyebrows contracting. "Not it alone," he observed. "Wilder & Wilder. That means you and the rest of us."

"It's gone crazy!"

"I don't know," said Addleton thoughtfully. "Isn't that, after all, just what Wilder & Wilder is out to do?"

Raleigh stared at him.

"You think this is what happened to Mo-Kan?"

Raleigh hadn't started thinking yet, but that made him jump. "It's possible. Wait a minute." Stepping to Addleton's desk, he called the phytogenesist who had made the report on the bacterium. After a little difficulty he got the other to remember it.

"Oh yes, 'Mustn't Touch'. What article was that?"

Raleigh gave him the file number. Frowning, the other punched it out,

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skimmed through it, nodded. "I remember now. What? *Published?* My God, no! That thing had too many of our secrets in it!"

"Then how'd the Archimage come to pass it?"

Baffled, the other shook his head. He paged worriedly through it, scowled pushed the page button several more times, shook his head in amazement and said, "This isn't the report I filed! A lot has been deleted—all our classified techniques. What's left is innocuous enough." He stared at them. "What's cut is significant. One sentence explaining that the bug blots up metallic poisons like a sponge."

"And you didn't order it published?" Addleton asked.

"Hell, no. I never heard of this whatzit journal till now."

"No one else could have done it—except the Archimage," Addleton told Raleigh.

Raleigh sat back down. He stared at Addleton. "But the Archimage wouldn't. This has nothing to do with running Wilder & Wilder."

"It might have had a lot to do with it if we hadn't warned them."

Raleigh scowled. "Damn it, a computer *can't* want to take over the world. Unless it was specifically designed to do so. A computer does only what it's told, and it never improvises on its orders."

"Well, that's really what the company wants, though no one would admit it. Maybe the Archimage deduced that."

Raleigh shook his head doggedly. "No. The computer system is bogged down with day-to-day chores. It couldn't possibly see the situation as a whole. That takes a lot of mental ability, and the system has few circuits left over for that kind of thing. That's why Lariann's questions bothered it so. It has to have been instructed . . ."

The men looked at each other in startled awareness.

"Games plan!" said Addleton suddenly. "What kind of program was that?"

Raleigh had been reading up on Games Theory and various other esoteric studies and it finally occurred to him that business was a military game—very much like chess.

He had reprogrammed the Archimage to consider its operations as a military campaign. Business computers studied the market to determine what to produce, how much of each, and what to charge—or if it could be produced for a profit at all. It had been obvious to Raleigh that much of the market's fluctuations were created by those selfsame computers, studying the market to optimize output. If the Archimage could out think them—allow for the effects of their decisions—it could control the market indirectly.

The corollary to that was obviously that Wilder & Wilder—and the Archimage—was to dominate the world.

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"How long has this been going on?" asked Addleton.

Raleigh had to think back. "Almost four years, I think."

Addleton nodded sourly. "I *thought* we'd been having awfully good luck," he remarked. Both of them ran their minds back over the past, wondering how many of their competitors' strokes of misfortunes had been caused by the Archimage.

"I would've said that a computer couldn't take over the world because it has no direct influence on it," said Raleigh slowly. "But the Archimage has plenty of pull, it seems."

Addleton looked at him sharply. "Think there's any real danger?"

Raleigh shook his head. "Any time we want to change programs, all we have to do is tell it so, and it'll schedule things so the company doesn't lose money. Of course you have to have the new program ready, and it takes a month and the computer system itself to cut one. But, if there was any *danger,* we could just shut down without planning for it. It'd cost us in penalties for late deliveries, and so on, is all."

"And what if the machine refused to shut down?"

Raleigh laughed. "You've been viewing too many adventure shows. Immobile computers don't have self-contained power supplies. You just pull the plug. And you don't need to worry about being electrocuted; the total amount of energy in a computer wouldn't much more than kill a mouse. It couldn't harm a man. Or take over the power plant by sending signals along the wires, or shut and lock doors, that kind of thing. It hasn't got readouts for it. Such defenses would have to be built deliberately."

"So the only danger is this indirect poisoning stuff, though poison wouldn't be its only method of getting results," said Addleton.

"No. And even here, nobody would have died—unless they were already pretty weak. The only real sufferers would have been Mo-Kan. Question is, is it safe—for the public—to keep the Archimage on this program?"

"It's a temptation," Addleton smiled. "It'll work only until the other companies catch on. And when they do," he added, the smile fading, "My God! Ten thousand computers fighting each other for control of the world!"

"Could they actually take over? Say, if they began to cooperate with each other?"

"Such cooperation is called merger," pointed out Addleton. "No one computer system could run the world. And computers can't cooperate without being reprogrammed, if they've been programmed to fight each other. There *might* be some danger," he added, looking at Raleigh, "to us. It's already called for the firing of one employee—a thing no business computer does. It may start making the same kind of decisions about management personnel any time." He brooded on it, said

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cautiously. "I think we'll leave it on this program, now that we know what it's doing. We'll check every action carefully for harm to the public or us. And, let's keep it between you and me."

"That might be safer. If a leak got out, the public would panic. And worse, other companies would soon be on the bandwagon—or the march." They grinned at each other. "They'll never know what hit them."

"This program does have its drawbacks, though," said Addleton. "It's prepared to believe the worst of people who make mistakes or waste its time."

"My God, yes. What do we do about Lariann?"

Addleton picked up the sheet of paper with her transgressions on it. He looked them over with a faint smile, looked up at Raleigh, and said, "For a starter, you might try proposing to her."

But when Raleigh got back to the hub office, he found Lariann's desk lit up with red lights again. Two quick steps took him to a point where he could see the back wall of his own office through the door he had left open. It looked like a Christmas tree in Red Square.

"Not again," he groaned. "What'd you do this time?"

"I've found out what's wrong with the Archimage," she told him proudly. "When it gets this computed, it'll be all right."

"Gets *what* computed?"

"Well," she blushed, looked down at her desk. "You did invite me out tonight, didn't you? On a Tuesday night?"

She hadn't, she had explained coyly, been "available" over the weekend. He was serious enough to ask her out on a Tuesday—the acid test.

"Then I'll show you." First she had asked it, *What does Alvin Raleigh think of Lariann Davis?* It had answered: *He thinks she is a spy from some competitor.* It could be sure he thought that, having told him so itself.

She had then instructed it, *Lariann Davis is not a spy. Recompute everything on this basis.* The ironic thing was that, though it believed her to be a spy, it was programmed to take orders from this desk, regardless of who gave them. The Archimage was only a machine. So it was now thoroughly changing its rigidly logical mind.

Raleigh gasped. How far would such reprogramming go? It had firmly believed her to be a spy, as that was consonant both with her actions and with its own program. Her actions could not be changed. Therefore—

He stared through his door at the blazing wall. Some major mental operation was certainly going on—far greater than her simple instruction would have indicated.

Raleigh sighed. Then he smiled weakly at Lariann.

"You came, you saw, you conquered," he murmured. ■

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Life on Ondine was pleasant enough. Life was pleasant on most waterworlds. Ondine's planetary grav was .9 a standard Terran G, and its atmospheric oxygen ran rich and high since it was supplied by the world ocean's broad floating plankton beds. The lower G value and the high oxy together produced a common attitude on Ondine: a light step and a heady sense of alertness.

Exhilaration and a newly acquired sense of freedom was the mark of the new arrivals on Ondine. You could see it in their faces and bouncing walk as the men and women—freshly arrived contract workers for the most part—tumbled through the concourse at Downport, minutes in from planetfall after being cleared at SkyHigh, the orbiting reception port.

At that moment, Josun Pace wished he felt as good. He was an exec, a somewhat harried vice president in the planet-owned Marine Resources Complex. And today his radio speaker had jerked him out of bed before 5:00 a.m. local time.

An emergency situation existed on board the island-sized fishing factory, *Capricorn*.

A delegation of Terran investors and would-be advisers from BuFed-Plan's ET-Development Department were *en route*. These junketing representatives, together with wives and private press corps could be expected to arrive at the end of the week. (As usual, the person who sent the advisory message did not bother to match its arrival to local time.)

And, while he was trying to wake up and deal with these matters, another problem offered itself for his attention. He paid reluctant notice because it concerned Nurse Chi'en Li, who carried the atoll's medical service in her medical kit and her supple, graceful fingers. She had a new patient. He was not only large and brawny, he also was stark naked.

A case of schizophrenia, when Kleis immunization shots were given everywhere, from childhood up, seemed completely incredible to Josun. He'd have found it only slightly more incredible if someone had appeared on Li's doorstep scratching at fleabites and suffering obvious symptoms of Black Plague.

Her message to him was recorded and played on a loop until he hung up. He could get no more details until he went and saw her. (Li was pretty enough for that to be no chore.)

All he knew now was that the patient had arrived unconscious after being picked up by the Research Vessel *Lt. Maury*. And some handy sailor had sewn together a straitjacket. The *Maury*'s captain wished off his strange passenger on the reluctant Nurse Chi'en the moment the research vessel arrived.

Other than those bare facts, and notifying him her patient was now awake—and securely barricaded inside a windowless room of the dispensary—the lovely nurse's message told him nothing more. He stumbled

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nto the bathroom and threw water on his face. On the way back, he hit the dial selector beside his bed and punched the demand button for a cup of steaming, organic coffee.

It was a luxury. The beans were shipped from Nova Brazilia, and he paid the exorbitant freight costs. Cafe-substi was the normal drink, tasted almost as good and was much cheaper. But on mornings like this, Josun Pace—one of the few people who could taste the difference—felt that the extra money he paid was well worth it.

Ondine's sun was a sol-type primary on the feathered edges of the Pleiades. It broke redly over the lagoon as he sealed the hatchdoor on his hurricane-proof house and clattered over the *palma* logs set in his private pier. He went hand over hand down the short ladder and lowered himself into the driver's seat of his moored waterbug.

A spreading gold arrowhead marred the lagoon as his bug purred over the gently swelling water. He paid little attention to the tropic daybreak—even though it was spectacular. He was deep in radio conversation with the second mate on the *Capricorn*.

The fishing factory's number-eight seine had goofed. (Actually, its overnight safety detectors had failed.) While a frustrated electrician's mate attempted to rig around the trouble, the misguided seine automatically spotted, pursued and captured an entire school of Ondine's highly poisonous scabfish.

Whoever had the catch-monitoring duty on the bridge last night either fell asleep, or stepped out for coffee. Before the mistake was noticed, the seine completed its programmed course of action and dumped the whole, slimy load down a factory process hopper.

(The captain, Josun learned secondhand, was coldly furious; a state of mind that did not bode well for the junior officer responsible for that watch.)

Decontaminating the pressing, milling and freeze-drying equipment the scabfish had passed through was bad enough. The second mate was unhappy enough about that. He had just supervised the stripping down of all the equipment. But what was worse—the conveyor chutes had done their job as well, and now the highly poisonous fish powder was mixed with good concentrate in one of the huge storage bins.

Everything else could be solved aboard the *Capricorn*. But the captain—and here the second mate grew more cheerful—would like some advice as to how the factory could profitably dispose of fifty tons of toxic fish powder.

"In other words," Josun growled into his mike, "you want me to find a market?"

"That is correct," the cheerfully-crisp reply came back. (The second hailed from the United Islands on New Anglia.)

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"After all, VP Pace—what's an executive for? Your function is to reach over the heads of we poor toilers and snatch brilliant solutions out of the air."

Dryly, Josun replied, "Do you know how many commercial applications we have found so far for scabfish?" The second admitted that he didn't.

"Exactly none," Josun told him. "The toxin can't be separated. It's an oil and found in the flesh, scales, spines—every part of the fish. Also anything that comes in contact with it becomes poisonous, too. So far our laboratory workers only know how to decontaminate—when it's impossible to throw the affected stuff away. And I recommend your captain see that all metal-work is cleaned exactly the way our lab says. Otherwise, later results with fresh caught fish could be pretty dangerous."

He paused and prepared his parting arrow. "In this case, Second, if I find a commercial use for your fifty tons of scabfish powder—the solution won't be just brilliant. It will be close to a miracle, or a stroke of high genius."

He switched off the set.

Moments later, his bug coasted to a swaying berth next to the public power pier. He was going to be busy, and his bug's batteries would require a full charge. The two insulated cables unreeled from the pier and he locked their outlets into the stern.

Ondine's colonizers had not made the mistakes that—two centuries before—came so close to killing Earth's own oceans. Leaded gasolines, oil spills, detergents and DDT— For Terran sea life they may as well have been the Four Horsemen of the Apocalypse. The by-products of early technology proved an ecological disaster.

The legendary Scripps' Institute warned as early as 1969 that DDT concentrations were growing in oceanic phytoplankton—the source of seventy percent of the Earth's oxygen. And in 1970 two famous men, Jacques Costeau and Thor Heyerdahl, each warned the world that the oceans had not much longer to live. At most, Costeau estimated thirty more years.

He was wrong by an overestimate of ten years.

The governments who'd fatally procrastinated were blown away on the winds of famine, internal revolt, and—finally—the short Asiatic Nuclear Exchange.

Josun knew the skeletal outlines of how men had survived to repopulate the world with life. Without the new underwater cities and the help of the amiable, amazingly skilled porpoise, it never could have been done. Even so, two centuries later, life on Earth was still grim. A full thousand-year cycle might have to roll by before genetic experimentation and research replaced the staggering roster of species that human technology had destroyed.

But one lesson had been learned.

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Men on Ondine were scrupulously careful not to injure, not to pollute, and were vowed *never* to damage the panocean's life-support systems. The colonist's own enlightened self-interest kept them vigilant and wide awake.

Two things brought him out of his thoughts. The cells in the bug's heavy battery finished charging, causing the current to click off, and the musical voice of Chi'en Li spoke to him from the pier.

"VP Pace -on my recorded call I told you our dispensary is now used to quarter a maniac. Would you like to see him?"

Josun glanced up, slitting his eyes against the light of the climbing sun. Chi'en Li's graceful body stood in silhouette. Had it not been for her efficient nurse's voice, she might have been any languid and bewitching Polynesian girl. (Her family in fact, Josun recalled her telling him, were Chinese-Samoan.)

"Good morning," he answered. "How come you're up so early, Li?"

She gracefully indicated the coral block building that was the atoll infirmary. Its white walls caught the sunrise in rose and orange. "I was awake all night. I told you we had a maniac. He fluctuates. Apathy mixed with short interludes of violence." She repeated her original invitation. "Would you like to see him?"

Josun almost declined. Nothing would be accomplished. His other problems demanded every minute of his time. And he felt uncomfortable sticking his nose into a medical affair.

But if he refused, would Li think he was frightened? Or—worse—indifferent? He stood up in the moored craft and said: "Thank you, Li. I certainly would like to see him."

He'd been spearing fish in the tide pools when the boat landed. So he'd been naked. What matter? He hadn't worn anything but a leaf, or two, for years. And *their* manners certainly left something to be said! The idea. No human company for years then, when finally after hope had sunk to nothing and he'd almost forgotten what other men are like, how do they behave?

Stood around in a circle and gaped at him. Like a ring of stupid apes. So he'd growled at them. So what? After all the years of silence, words weren't that easy to use. Sea wind and vast silence had leached the meaningfulness from his brain. Was *he* to blame?

Frustration rose in him. It came periodically. He could watch it build inside like the rise of steam in a fumarole. When the pressure bulleted him upright, he howled across the little room once more and beat his large, hard fists on the heavy door.

"My patient's apparent age is fifty," Li said as their feet crunched up the shell path leading to the infirmary. "True age as well, I believe. He hasn't been getting any of the

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anti-aging treatments that are available."

"No. Nor any Kleis vaccine, either," Josun said. "You certainly have a rare bird. Schizophrenia's a less common disease today than is leprosy." Ironically, it was true. Medical research had identified the blood fractions found in schizophrenics and had gone on to vaccinate against them; in a similar way, even the primitive Twentieth Century had protected its population against polio and measles. Because of Kleis vaccine, researchers today were hard-put to find an effective hallucinogen. (That's an idea, Josun thought, was scabfish toxin, like quite a lot of other poisons, able to produce hallucinatory states in sublethal amounts? He would check into it.)

But, successful as medical science had been in other areas, the—mercifully rare—onslaught of leprosy was something medicine could not as yet prevent. No vaccine worked against *Mycobacterium.*

"The real mystery is *who* he is," Li told him as they crossed the dispensary porch. "No agency on Ondine, nor at Downport or up at SkyHigh, has any record of him. No identity."

Josun protested. "But he's on the planet, Li! SkyHigh's the only reception port. And we *know* he wasn't born here, else where's his birth record? So he has to be filed in Reception's computer banks. Try general description and retinal prints. Those would match up no matter what his age. Maybe he gave you a phony name."

"No. He hasn't given us any name at all. And we took his eye prints while he was still unconscious."

"And—?"

"As I said, no record anywhere."

He was stopped at saying something further by the ear-splitting shriek that blasted down the corridor. "Lord!" he said, and shook his head. He almost felt deafened. "Does he always make that much noise?"

But Li hadn't stayed to answer the question. He turned and followed her form before it could disappear down the hall. The first thing that caught his eye was the tumbled chair, lying on its side at the end of the hall. A red-eyed orderly jittered nervously beside it. And a torrent of sound—so loud it was hard to believe its source really was human—tumbled out of the grille set in the heavy locked door.

As Josun watched, the orderly peeked with great caution in through the grille.

P-sss-t! Josun's ears caught the sharp hiss of an aerosol can. Without warning, the square opening filled with a purple vapor. The orderly reeled back, mopping at his face. His face bright purple. Josun noted the color with relief. At first glance he'd mistaken the dye, or whatever it was, for blood.

"What's he got in there with him?" he asked Li.

"A large can of skin spray. We overlooked it when we cleared out

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the room. It's harmless. But it just shows again that it never pays to rush." In all the time he'd known her, Josun found himself surprised to learn that Li could be distracted.

A pair of stark eyes, mounted in a wildly bearded face, loomed in the door's opening. The face was laughing. Josun moved in obliquely, ready to dodge the spray can.

Li started to voice a warning, but the old whitebeard burst out in renewed clamor. "SCU-TTLE fish sherbet drowned sneaking seeking! But time is disproportionate. Slipping off stars hours BUBBER-lubber brother! Haw-HAW! It's all me same skidways down grease slooked paths SKIDDER-Bum! Clangbang in pots and tinsels at the end. HAW!"

Catching a lull, Josun quickly asked her, "Does he always bellow out great chunks of Joyce?"

"Of what?"

"Nothing. Very old writer on Earth. Syntactically, our friend here sounds a little like 'Ulysses.' But I guess it's just a chance resemb—"

BOOM

The door bulged in its frame. Josun checked his involuntary jump. For a brief moment he'd thought a pre-season hurricane had hit the island. Calmly, he said, "I'll send somebody over from Maintenance and get you a good solid bar for that door."

It was obvious they were going to get nothing useful from the patient himself. Josun started to suggest they adjourn and use the radiophone in Li's office. A soft voice spoke behind him.

"Where did you all go?"

Josun turned and found himself pinned on the eyes of the madman. Unsettling sort of person. "What did you say?"

"Where did everyone go? Wink-blink! I was flying—then everyone was gone. Where did you go?"

Josun drew closer, but stayed alert for the aerosol can. Through the grille he could see the man was covered by nothing but his own hair. And there was plenty of that. His beard was saltwhite—where it wasn't darkened by dirt. His chest was grizzled but wide, and the redbrown mahogany tint on his arms and knotted shoulders spoke of years spent under the tropic sunlight.

With a start of recognition, Josun thought: He looks like a picture I once saw—I remember, it was in a children's book. He looks like the illustration of the Old Man of the Sea.

Aloud, Josun temporized. "We're not sure we know what you mean. Something very odd must have happened to you. Why don't you tell us about it?"

The soft voice almost became a croon. "I was flying—high oh high in the lacey sky. Up where it's black not blue and the world is round-around-round."

That sounded interesting. Josun asked, "Was it a spacecraft or a flier?" Li frowned. He realized

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questioning the man was a mistake. He let the quiet voice go on.

"Between the stars? Yes, I was there. It's black and the stars are icepicks. Jab, jab—in the eyes." The tone became distant, official. "Warning: Keep light shield setting at polarization level 2A during all Jumps. Canopy monitors will automatically darken shield in event of flares. Wear eye protectors as additional safety precaution when circumnavigating nebulae and heavy clusters."

Surprised, Li whispered, "What was that?"

"Warning plaque riveted to spaceship consoles. In the smaller, private jobs that plate is just below the pilot's line of sight."

She nodded. "That explains it. Peripheral vision would pick it up and feed it uncensored into his unsconscious throughout the flight."

The voice crooned to itself. "But I flew low. Low and slow—Sorry, gentlemen. First infraction, please note. Not a hanging law. Just traffic violation for God's sake. Where *am* I? The ocean's a plate. Big, blue, round plate. For years I ate from the blue ocean's plate. I broke flight regs. Sorry. Warning stamp across wrist maybe but yes registration all in order no not normally given to careless behavior just minor offense, gentlemen." The volume climbed. "Is it reasonable I ask you to put me in solitary confinement for my first *minor* offense? Ha-ha-haw-Haw-HAW!"

Josun grabbed Li and skipped back.

P-sssss-t! But the cloud of purple spray caught nothing more than the front lace and a cuff ruffle on his exec shirt. He'd meant to throw it away soon anyway.

"Come on," he said to Li. "Let's use your radiophone."

As Josun sat in Li's office, gratefully inhaling a cup of genuine tea while he made call after call, two very interesting events were taking place elsewhere.

A newly purchased—and very expensive—private spacecraft was cleared at SkyHigh. A young, spoiled Terran was the pilot. Kelvin Dahl's father—a minor aristocrat in the hereditary Terran bureaucracy—had bought him the two-seat Skydiver as a graduation present. (The ink on young Dahl's degree making him a hydroengineer was just barely dry.) Dahl had hopped ahead of the junketing BuFed party to whom he was at present assigned—with, of course, some pull from father—as technical assistant.

Cutting across star to star rather than following the normal track the passenger liners took saved him almost a week. He meant to use that time to loaf. Quite naturally, when his craft broke out of deceleration up in the altosphere and Dahl rolled his vehicle through a set of lazy wingovers to test the controls for atmospheric flying, the pilot had forgotten all about SkyHigh's orders to

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set his craft on Downport's landing tarmac immediately.

Far below, and a quarter of the way around the planet, Josun hung up the mike and admitted defeat. "You were right, Li. No one has any record of him. I asked SkyHigh to widen the search parameters and send the retinal pattern through their computer again. This time, it'll kick out any print above so many points correspondence. They said they'd do it, but it will take them a couple of hours until they can get around to it. I gather new arrivals are keeping all of them fairly busy right at processing.

"Oh, yes. Pharmaceuticals at Downport is sending you a batch of somnoline quick. I think you'll get it on the next hydrofoil. It'll keep him quiet until we can come up with more permanent quarters."

Li thanked him gratefully. The patient was quiet at the moment. No sounds issued from his room and she had told the tired orderly to lie down in the dispensary and get what sleep he could. There was no telling when their patient might grow violent again.

But the second interesting event took place. Just as Dahl's ship eased past the first of the Ondinean Van Allen belts, the old man stopped pacing his room—and faded quietly, without fuss, into the air.

No one witnessed it. But, a moment later, the room was empty.

An hour had passed when Dahl became bored with sight-seeing and took the Skydiver down—and down. He pulled out, and the craft screamed over the wavetops—a cutback on power. He flew now at an altitude of three hundred feet and just above his arrowshaped ship's stalling speed of a hundred and eighty knots.

It was dangerous. But Dahl knew the flying characteristics of his ship and thought he'd allowed for mishap. He was not a total idiot, just young.

Unfortunately an aerial map of the area—such as he would have been given at Downport's reception and briefing—might have told him his track was already cutting across and below traffic patterns—and that his ship was headed straight into a nest of powerbeams.

He flew on, fascinated by the coral unfolding on the shelving bottom. He never saw the beam. But he hit it.

A gigantic fist closed on his ship and enveloped everything in fire. Chain lightning crashed inside his ship's drive room. Blazing furiously, the safety breakers fused and shunted the full overload into the stardrive.

Warning: *Safety features do not permit operation of Möbius warp drive within five diameters of adjacent planetary mass. Do* not *attempt to activate drive inside this limit—or to circumvent the safety features which prevent it. The results are not known, but theoretical analysis indicates the interaction between a stardrive field and a*

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large mass will produce consequences that can only be classed as hazardous!

The plaque flashed, dissolving in the same electrical surge that melted the "safety features" in a power load they were never intended to meet.

A microsecond later, the stardrive screamed into demented life.

And below, a molten wing tip together with smaller pieces of wreckage spun and began the drop to the water. A few scattered splashes marred the ocean some moments later.

The spacecraft itself, and its pilot, were nowhere to be seen. They had winked out of existence.

Josun grimly held his waterbug in the clear water between the two arching white spumes thrown out by the speeding sea ambulance. Li, the driver and an attendant were inside. They were all racing to the power station at Shark Jaw. A worker there was burned on his face and arms, caught by backlash when the beam was intercepted and the powerboard blew.

Though concerned for the man, Josun's problem centered on the wrecked spacecraft reported to be down on the bottom of the channel between Fluke and Jaw. Every minute it was allowed to stay under meant damage to Ondinean sea life, for it was certain the wreck was oozing contaminants out of its ruptured hull.

The bane of life on any of the waterworlds was Minamata disease. It was named for a Japanese bay where mercury pollution poisoned the fish, and then the people who caught and ate the fish. It was a hazard on any world where men lived in balance with an aquatic ecology. Though by now the name had become generic and meant any disease whose root cause was a water contaminant introduced by men, it could happen at any time—and, indeed, had apparently happened just that way this time—through human miscalculation or accident.

Josun didn't give two worn sea-turtle teeth, as the saying goes—largely because Ondine's sea turtles, like Terra's, are toothless—for the pilot. He wished *him* a merry afterlife in Ondine's submarine volcano, Torch Hole. It was the wreck Josun worried about.

But it would have surprised the exec no end to learn the pilot was not only still in his corporeal flesh, he was in surroundings that—though not as bizarre as Torch Hole—were in their own fashion a lot stranger.

He was down in shallow water. The surface looked to be about ten feet above the fused and peeled metal of the wreck. The nose of the Skydiver was a shambles—and filled with water.

Unquestionably the instant action of the survival capsule—this model's most touted feature—had saved his life. He was surprised. With all the advertising he hadn't expected it would really work.

He pulled his arms loose from the

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triggered shock cushions and peered through the heavy transparent wall. The bottom was curious: a sulfur yellow mud. Dotted with orange sponges and stalked plants he couldn't identify. And that was strange. He knew the more common forms of xeno-marine biology, and he'd briefed himself on modern Ondinean sea forms before he left Earth. He recognized nothing as familiar. Even the mud was a puzzle. He distinctly remembered flying over a turquoise channel whose bottom shelved up to make coral fringes and white sand beaches on the islands to either side.

Another question: what had caused his crash?

He remembered nothing but an incredible flash, then he was down in the water. And somewhere that was hundreds, perhaps even thousands, of miles from where he'd been. It didn't make sense.

Bending over, he pushed the lower cushions aside; they were relaxed now the fuselage had stopped jolting, and pulled out the big crash kit from under his seat. The med kit furnished a psychic energizer. While it worked on him, he examined the contents of the survival kit.

Spread in his lap were soon-to-be-eaten food packs, a set of manuals, and some stiff wire and synthetic netting, the needed items to spear, shoot, trap or net his forthcoming dinners. With relief, he found they'd included a small analyzer down at the bottom of the kit. Eating nonterran proteins without one generally meant a lethal bellyache.

He turned his attention once again to the outside. The second time he saw it the garish seascape seemed oddly familiar. It reminded him, not of anything he'd ever seen before, but of—what? A half-forgotten color plate he may have seen in some book when he was a child. The sponges, for example, were definitely primitive. Almost hollow tubes, rather than true sponges. And the horseshoe crabs crawling around in the yellow mud. Weren't they a direct descendant of trilobites? On Earth that made them a life form that was at least a hundred million years old. On another oxygen-water world like Ondine he assumed the evolutionary span was similar—

The thought rose unbidden in his mind. Suppose he was wrong and his ship hadn't shifted its location. Could the bright flash somehow have thrown him, not through space, but through—time?

He had no chance to explore the thought. A bright orange tentacle, its inside edge lined with pulsing suckers, draped itself in a coil around the capsule shell. He whirled around and confronted the horror that had slipped into the wreck with him.

For its part, it regarded him calmly enough through saucer eyes—or perhaps they were not capable of much expression. Another tentacle wrapped around the shell—and another. There seemed to be ten of them in all. It could have been a

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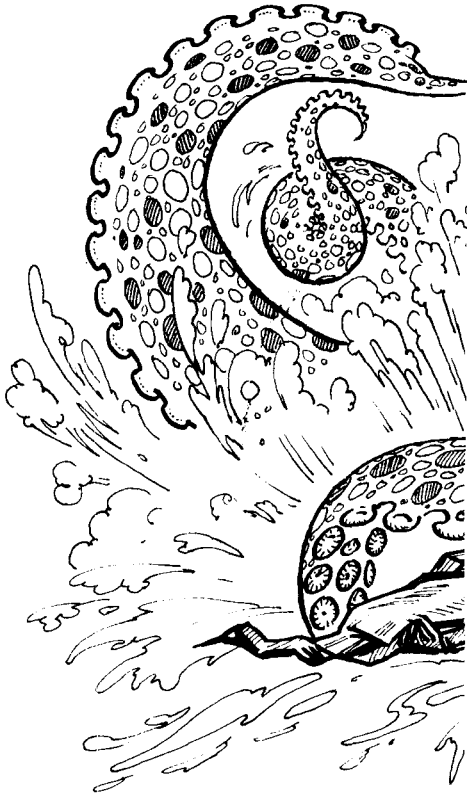
squid were it not for the conical body shell that covered its upper length like a dunce cap. (And how many millions of years had gone by since squids and octopuses had lost their outside shells and kept only a light internal cuttlebone?) The arms moved faster, and the parrot beak slid frustratedly over the smooth crash capsule.

The engineer screamed.

He knew there was no danger from the monster. Its beak certainly could not pierce the shell that, though transparent, was much tougher than armor steel. He screamed because the ocean bed had tilted, and the waters were rushing off like moisture from a plate. It grew dark. And the world spun.

His face was thickly bearded—then he was cleanshaven. Old, then young. Morning alternated with midnight. He was everywhere at once: listening to a man who asked him questions through a grille, skipping over rocks, trembling under the lash of a tropic storm. His feet stepped cautiously, wary of sea urchin spines, in the pools where he spearfished. And at the same time, he reeled and stumbled up a shale beach—half-dead from exhaustion—while his as yet unhardened feet copiously bled and left ruby footprints on the blue slate. Somewhere else he walked through a puzzlingly open door and down a night-darkened



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hall, before he stepped outside into the silver night.

The dizzy spell gradually lifted. But not before he escaped countless deaths, cracked thousands of shells for their soft meats, went parched and dry until he could wet his mouth with the fluids wrung from a fresh-caught fish, howled in distraction at the vast *emptiness* of sea and sky, hoarded water when it rained and, after hoarding, drank sweet delicious mouthfuls time after time after time. He starved and he glutted, baked in the sun, danced shivering on a rain-soaked beach. And he did all of it *all at once!*

When the disorientation cleared—it spiraled in his mind and then jumped upward like a waterspout lifting—he was left sprawled on a watersoaked ledge, the crash kit held firmly against his chest. Of his ship, the squidlike monster, or even his crash capsule in which he—presumably—had floated away, there was no sign. Instead, he was stranded on a hard gravel beach with his flight suit ripped in a dozen places, his eyes swollen and red from saltwater, and his skin smarting with abrasions.

With great care, he got to his feet.

It hurt to move. His body wavered, and he was so tired the sensation actually frightened him. He'd never before in his life been as exhausted. But he knew he needed shelter and a fire. Moving crabwise and holding grimly on to the chest, he picked his way over the rocks. In five minutes he had worked his way back from the breakers and was in a shale cove with a coarse sand beach.

He squatted in a narrow fissure out of the reach of the wind. Tomorrow he could work out a signaling pattern using rocks on the beach. Air spotters were certain to be out looking for him. But right now he needed rest and food. If he could make a fire, perhaps he might even dissolve one of the brown cubes in his kit and produce a hot, steaming cup of cafestim. The essential thing was to keep his mind clear.

The disorientation he'd suffered earlier was dangerous. He couldn't afford it, not in the situation he was in. It made him wish he'd ignored his father's scorn and gone back for the Kleis booster shot when he was eighteen. The vaccination was required by law for every child that was thirteen. But on Terra—well, health regulations were lax, and a haughty aristocracy did pretty much as it pleased. Even so, most aristocrats happily had their children immunized. Only a few, like Kelvin Dahl's father, regarded Kleis vaccine as an insult directed at the purity of their family's bloodlines.

He jumped suddenly. Scooping sand away, his fingers felt—He threw sand away with both cupped hands. And met in the shale the stone face of the shelled, tentacled animal he had just eluded. His fingers recognized it from its fossil ridges before his eyes ever saw it.

Stepping back, he calmly surveyed the shale cliff. He was surprised how

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calm and detached he felt. He could almost ignore the feeling he had that his mind was about to capsize.

A thick line of rusty red, the familiar trace of iron oxide, ran through the rock. He was not surprised. It seemed to him that, somehow, he'd almost been expecting it.

Critically, he traced the red line through the rocks. He did it as though it were a class exercise and meant nothing to him personally. He traced the line around twice to make sure. There was no mistake.

Finally, he followed with his eyes until the exact outline of his ship! He stared at it stupidly for a long, long time. Presently his body began to tremble, though the air was warm. And over the ever-present sounds of wind and surf, he was surprised to hear himself begin to laugh.

Efforts at the crash site failed to bring up more than just scraps of the spacecraft. For some reason no one understood, they could not locate the main body of the wreck.

Josun and the salvage men had gone over the charts, looking for crevasses or potholes, into which the wreck might have rolled when it sank. There were none of sufficient size. But another possibility presented itself.

The channel between Fluke and Shark Jaw was relatively shallow, but a stiff current ran through it and it dropped off steeply at either end. Had the spacecraft hull kept enough positive buoyancy, the current could have swept it out of the channel altogether and over the drop before it settled. It was a possibility that made Josun sigh. If true, it meant the wreck could be down as far as two or three miles underwater.

"All right," he acknowledged. "Keep looking in the channel just on the chance it's wrapped in balloon kelp, or veilweed. But I'll call the seamine people and see how long it will take for them to tow their bathyscaphe over here."

Not surprised, the salvage master said, "So you'll go after it all the way, even if it has sunk off the shelf."

"That's right. The hull liberates heavy metal salts every moment it's down there. And I don't even care to think about the radioactive compounds that are forming this minute in its engine room. As long as it's sunk it will be a potential headache. I'd rather find it now, before it can hurt us, than wait and wonder if every shift in fish population, or new fauna in an upwelling area, or decrease in one species of phytoplankton, has something to do with our intruder."

Basically, the salvage master agreed. But he felt obligated to point out some of the difficulties. "Bringing anything big up from depths like those is never easy. Pressure's enormous. Flotation doesn't work. Blowing water out of a hull against hundreds of atmospheres of pressure just isn't feasible. And finding even a synthetic cable that won't break just

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from its own weight at that extreme a length—" He didn't finish the sentence because he felt no need to state the obvious.

Josun countered. "We can cut it into smaller pieces with the bathyscaphe's work arms, hook it to the underside and tow it up in sections. Or, better, assuming that new polymer epoxy they are using to shore up their ceilings in the sea mine is as durable it's supposed to be, we can simply engulf the wreck in a load of it. It sets up fast, is unaffected by temperature or pressure and, supposedly, will last forever. To be safe we can run checks on it every ten years. I bet that would effectively neutralize the problem!"

The radiophone signaled a call coming in, and they postponed the discussion while Josun answered it. It was Li, calling from the dispensary. Her burn victim, packed in refrigerated plasti-skin, was on board the medical copter and being flown to Downport hospital. He was in reasonably good condition, considering his burns. And then Li dropped her bombshell. She'd arranged for several specialists at the hospital to examine her mental patient. But when the copter arrived and they'd gone to his room to get him—her patient was already gone!

Josun sat up. "That's very interesting, Li. You lose your patient. And over here I seem to have lost a spaceship. It's quite a day."

"What's happened?"

He explained. "Up until now, we assumed the wreck was carried away by a local freak of current. But after talking with you, I'm beginning to wonder. There's just too much coincidence piling up."

Li excused herself from the hookup. Another call was coming in. She came back on a few minutes later. Her voice was excited. "That was from the computer people at SkyHigh. They've matched our patient's retinal prints with an identity pattern—But it doesn't make any sense!"

"Tell me anyway, Li."

"The man who was picked up as a castaway on Lost Reef and the pilot of your wrecked spacecraft—a hydroengineer named Kelvin Dahl—are the same man! But, Josun, that can't be! There's a difference of at least thirty years in their age! Besides, Kelvin Dahl just arrived on the planet, and the other man apparently has been here for ages—" Her voice trailed off in bewilderment.

But Josun found he was grinning. "If what I think happened is really the explanation, Li, it's even more strange than that. My guess is the apparent age of the old man they found on the reef is just that—apparent. My bet is he's Ondine's oldest human inhabitant. And by a good wide margin!"

The line to SkyHigh was still patched in through Li's dispensary, so he asked her to relay a message for him. He wished to call on Dr.

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Price Teps, the chief astronomer at the globular clusters observatory in orbit above SkyHigh. Urgency Li could explain forced him to make the call in person and at once. He meant to order a chopperjet to Downport, and from there he would catch the evening shuttle.

"Li, as you may have just saved us a lot of needless expense and running around, can I show my gratitude by treating you to dinner tonight?"

"Will you be back tonight?"

"I'll make a point of it. How would you like a late supper on the beach? We can build our fire in that grove of palma trees. You know the place."

"We'll see. I'll give you a more definite answer after I see what time you get back."

"Just tell Dr. Teps the events as they happened. Then ask him this: What happens when a stardrive is turned on next to a planetary mass?

"I don't think he'll keep me long," he said confidently. He was already making plans for dinner. They included bringing a bottle of vintage wine purchased from SkyHigh's gourmet shopping center. "I'll catch the next shuttle down. And a chopperjet will put me outside your door by nine."

"You aren't going to tell me what this is all about?"

He grinned. "If you want to satisfy your curiosity, you're going to have to keep our dinner date." Josun signed off.

Nels, the salvage master, looked perplexed. Finally he burst out, "VP, I just don't follow your wake. How can two different people have the same set of eye prints? I thought that was impossible."

Josun nodded. "It is, so far as I know, Nels. How do you account for an old man and a young man who have the same prints? Remember, the retinal pattern is like a set of fingerprints—unique for each person—with the added advantage that they can not be altered or faked."

After a moment's thought, Nels said. "If the prints are identical, then they have to belong to the same man."

"Right!"

"And the difference in the age—well, that's simple. It could only happen one way. The first set gets taken when he is a young man, the other one after he's old."

Grinning widely, Josun said, "You couldn't be more right, Nels. As you said, it's the only possible explanation." He wasn't going to complicate matters by telling Nels the young man's retina had been printed at SkyHigh's reception desk some twenty-four hours *later* than the prints Li had taken from the old man in her dispensary. It was that point that had so badly confused everybody else. Yet Josun agreed with Nels's estimate. As he said, it was the only way it could happen.

Three hours later, the head of the observatory agreed. The white-

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haired astronomer pushed forward a paper readout roll that was covered with mathematical relationships Josun didn't even pretend to read.

"That's our first rough treatment of it," Dr. Teps explained. His smile seemed mildly apologetic. "Quite tentative, I'm afraid. But not conjectural. Oh, no indeed. Given the data at our disposal, the reality of time travel in this case seems firmly established."

Josun nodded in satisfaction. "Can you tell me in layman's terms, Doctor, just what happened to his ship?"

"It was thrown backwards into the planet's past, with him as the unfortunate passenger, until it stopped at a point we estimate to be between one and two hundred million years."

Astonished, Josun said, "That *long* ago?"

"It's a guess at the moment. We estimate that figure is the temporal equivalent of the longest distance in space that his drive could jump. Of course it destroyed itself in the process of throwing him and the ship back. His drive was never intended to handle the energies the power beam threw into it.

"That was a very astute surmise on your part, by the way. Do you know how a stardrive actually works, VP Pace?"

"Only in very general terms, Doctor. I know it sets up a distortion field in the space adjacent to the ship. The field collapses inward and extrudes the ship, which is then dimensionless, along one of the spatial axes, whereupon the field reassembles at the new location and the whole process is repeated again. Depending on drive force and field efficiency this can repeat from a hundred to a thousand cycles per second. For an observer on shipboard the net effect is that the ship has made an instantaneous 'jump.' But relativity prevents this. What actually happens is that mass and velocity remain the same—the ship only switches through a rapid series of new locations.

"To get anywhere the ship's field obviously has to be huge. Safety detectors are built into every engine, and their purpose is to cut out the drive by removing its power whenever an astronomical body approaches closer than is safe. The system is supposed to be failure proof. But it didn't work this time. I guess for the good reason the beam itself melted the safety blocks and supplied power directly to the drive.

"Normally, a stardrive can only operate out in space. But in this case the power thrown into it forced it to do *something*. What happened, Doctor, when the drive field tried to collapse around Ondine?"

Dr. Teps had been following Josun's words with a nonplussed expression. Barely hiding his surprise, he came back to the conversation. "What did it *do*? Why it couldn't collapse, of course. That would be the same thing as crushing the planet! The beam wasn't supplying anywhere near the power needed to do that. But as you point out, the power

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was being fed into the drive and something had to go somewhere. The three spatial axes were forced to stay the same. So, as you guessed, the field is actually four-dimensional and it was the fourth coordinate that collapsed. The ship was extruded along the axis representing Time. I believe he landed in an age that corresponds on Ondine to something roughly like Terra's Devonian period. A time of broad, shallow seas—and very primitive sea life. The most advanced animals were the mollusks."

Josun felt a little nonplussed himself. He shook off the feeling and said, "Yes, you mentioned that before. But by his appearance he's only aged thirty years. Where has he been? And how did he get back here in *our* time?"

Mildly apologetic, the doctor shrugged. "With any sort of certainty, I can't really say. There *is* no real analogy between time travel and space travel. But let me give you a metaphor.

"When we say 'time,' we actually mean any orderly rate of progression. The handiest measure is to clock the rotation of our own local planet. But that only gives us an arbitrary measuring system, a yardstick. To talk of 'Time,' well, that's something else. We mean one of the constituents of the Space-Time Universe. Suppose Time were a slope—"

"Why?" Josun interrupted.

"No reason at all," the astronomer replied mildly. "Except I need the mental image of a slope to make my analogy."

"Sorry. Please go ahead."

"Thank you. Now let's imagine one of us throws a rock up the slope. Let's further suppose the hill isn't smooth but has bumps and ridges.

"The rock, if it's fairly smooth will roll back to you. Oh, it won't travel smoothly. There will be bumps and ridges so it will skip and jump. Sometimes it will almost stop. Other places it will drop quickly.

"But when it stops, it will be approximately the same distance from the top it was before you threw it. Minus a little bit for friction.

Thoughtfully, Josun nodded. "I follow. And you think that actually happened to Dahl?"

The astronomer repeated his mild shrug. "I merely guess. The Second Law of Thermodynamics states what I have suggested much more elegantly. It calls the tendency to roll downhill 'entropy.' Is Lost Reef the remains of a land bridge?"

Surprised by the question, Josun had to think a moment before he answered. "Yes. I think it is."

"That might explain why you found him out at that particular spot. Remember, from his standpoint he's had to adjust to a new geologic epoch almost every week!"

"Poor fellow," Josun said—and meant it. "It's no wonder he went insane."

"Yes. A 'situational psychosis,' I believe it would be called. Kleis vac-

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cine can only do so much—and his entry record shows he never received his booster shot."

Josun thanked the astronomer and got to his feet. He was at the door when he remembered. "But what happened to his *ship*?"

He drew the mild shrug again. "I imagine it's scattered through a dozen geologic strata of rock. You needn't worry about it at this late date. It's no longer any sort of threat.

"In fact, if it weren't for the ship's mass, it would have no further relevancy to our time at all. Because of it, we have an interesting situation. The rock is still rolling."

Josun stopped as he was opening the door. "What? You mean we can expect to see him *again*?"

"Oh, yes—for centuries yet! He'll continue to roll, ah, 'futureward' until the ship's energy is exhausted. It all has to balance out, you see."

"Yes. I see," Josun said grimly. "Can you estimate his next appearance? I mean is there some way you can let us know when to expect him?"

Dr. Teps smiled. "No. There's no way to tell. But you may see a great deal more of him now he's so close to his original time. I'd be very grateful if you and your surface people would let me know every time he's spotted. It will prove a great help when I put together—or try putting together—my topographical-time map."

"Yes, sir." Josun opened the door again. "We'll certainly let you know. It's a matter I'd say we were acutely interested in, ourselves. Well, thank you, Doctor. You've gone to a lot of trouble, and you've given us a great deal of help."

"Oh, on the contrary, VP Pace—you've given me a most interesting problem to investigate. It is I who should thank *you*. I hope we stay in touch."

"I'm afraid we will, sir."

The bubblecar got him back to SkyHigh with ten minutes to spare. He felt lucky, so he consulted the port directory and a moment later was dialing the number of a ship whose home port was the advanced pharmaceutical world, Hermes.

The sales talk cost him eight of his ten minutes, but Josun convinced the ship captain his freighter could not afford to leave Ondine without taking on one last consignment—fifty tons of raw scabfish toxin in a neutral protein filler, for medical research.

"Remember now, Captain, it's a neural toxin—which makes it an interesting potential anesthetic, or defibrillator, or any of a dozen other possible uses . . . if it can be used at all, which I don't guarantee. But we will give your planet exclusive purchasing rights if it turns out that scabfish are valuable."

Reading Li's copy of the *Pharmacopoeia Galactica* this morning had helped him prepare his sales talk.

The "exclusive purchase" clause was his real lever in making the sale.

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The captain knew, as well or better than Josun, how valuable a newly introduced drug was on the interstellar market. And, sad to say, rival pharmaceutical houses on other planets were not above sneaking in their own versions of the new drug. Legal battles to prove patent infringement were costly—and court judgments in many cases were bizarre. The best guarantee that a drug firm had that its licensed ten-year monopoly on a new drug would not be infringed was simple: nail down the drug's source, so no competitors could use it.

The captain from Hermes tried to demur on one point. "But we *don't* need fifty tons!"

Coldly, Josun said: "I'm sorry, Captain. But that's the deal. Take the fifty tons *and* the exclusive purchase guarantee—or nothing. We're selling it to you at a very reasonable price, considering it's going to be used for pharmaceutical research." (The actual cost was ten times what Josun could have charged for uncontaminated fish protein.)

"Yes, yes," the captain said. "It's my fuel consumption I'm worried about. Couldn't you sell us a ton for the same price?"

"Sorry. All of it, or no guarantee."

After a short pause, "Very well. Send me the consignment."

"Done!" Josun slapped the button marked "contract recorded," and raced to catch his shuttle.

Wood smoke curled off the fire, sending a pleasant sting to their nostrils. Added to the fire's aroma were other smells—night air, warm salt tang, palma leaf drying next to the fire. Not least in Josun's consciousness-awareness was the scent coming from the flowers Chi'en Li wore in her black hair.

There'd been no spare moment to buy the bottle of vintage wine at SkyHigh, but he'd brought along a chilled bucket of martinis.

The alcohol blended with gusto when it met Li's dessert. (She had made frozen limeapples, topped with generous amounts of magenta custard.) He finished the fruit and downed his second martini before he completed the tale of the hydro-engineer, Kelvin Dahl. Josun still thought of him as "the Old Man of the Sea."

When he finished talking, Li said, "That's very sad. That's sad. Is there nothing any of us can do to help him?"

"No. I wish there were. But there's just no way to reach him. I don't know that we'll ever see him again."

"Perhaps. But I have the feeling we will see him again." She smiled. "More times than we may wish."

They talked some more, but of other things. And after a while Li got up, in the oriental fashion, and took their dishes down to the white line of surf to wash them. Josun sat and tended the fire.

"Josun—"

Her voice was just strong enough to hear. "Josun, he's back."

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Leaping to his feet, he dove between the palma trunks and sprinted for the beach. By the time he got there, she was alone. "Li!" he shouted. "Are you all right?"

Her eyes were distant as though focused on wherever it was the man had gone. He had to ask her twice. "You aren't hurt, are you? You're all right?"

She relaxed, leaning against him. "I'm fine. He didn't touch me."

"But what happened?"

"Nothing. He walked past me. He was singing. I couldn't understand the words. He saw me. He turned. Smiled. And he took—a flower from my hair.

"That was all. He didn't want to hurt me. He smiled, took the flower and walked away. In midstride he disappeared."

She leaned against Josun and shivered.

He put his arms around her and laughed with relief. Feeling far happier than two martinis justified, he said: "I think we have just met Ondine's new legend."

"What do you mean?"

"Don't you see it? Terra always had her legends. The Flying Dutchman, mermaids luring sailors onto rocks with their songs, all of that and dozens more. But until now Ondine was something too new, too freshly settled to have any legends of her own. Now he's given her one that's perfectly credible. Ondine has her own, genuine 'Old Man of the Sea.'

"Why, I think the old reprobate will enjoy it! He can walk the beaches, glimmer mysteriously in the moonlight, and jump out and yell 'Boo!' at tourists. And—he'll go on for centuries more!"

"You really think it will be all right for him? He'll be happy?"

"Happy? Of course he'll be happy. Why shouldn't he be? I almost envy him. Why, it's perfect!"

And perfect it was. By the time the children of Li and Josun had children of their own to tell, the stories about "the Old Man" were legion. He was often capricious, but it was seldom that he did any harm.

Whenever—and wherever—he appeared, he was greeted with gifts of fresh fruit and garlands of flowers. For as legends do, he had acquired a certain respectability in his old age.

Which does not mean his sudden apparitions weren't surprises—and often unwelcome by some, and certainly hard to explain.

Such as the time, with naked nonchalance, he strolled through the Terran party of blue-blooded lady tourists. Or the time he—

But it's best we leave it at that. By all accounts the Old Man was happy. He always sang.

Josun and the pretty Chi'en Li were left behind on their own part of Time's mountain slope. Or the "entropy gradient," as Dr. Teps named it. They didn't mind.

After the Old Man left them on the beach, they sat together and watched the stars rise. ■

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IN QUEST OF A HUMANLIKE ROBOT

Lots of people talk about building humanlike robots, but no one knows how to go about doing it. A major problem is finding a way to make a machine "think", and, unfortunately, the term "thinking" covers a multitude of sins.

by Margaret L. Silbar

In 1923 the Czechoslavak playwright Karel Capek introduced the word "robot," meaning "worker," into our language in his play "R.U.R." (Rosum's Universal Robots). The play dealt with an armed revolt of robots against the men who had created them. After massacring their masters, the robots found they did not know how they had been made. The robots would have been doomed to extinction had it not been discovered that an old philosopher had earlier endowed two young robots with desires and with love shortly before the fall. These two robots became the Adam and Eve of a *new* human race.

To what extent is any of this a possibility, in light of present-day technology? What *are* the prospects of being able to build a humanlike robot? These are the questions to be discussed in this story, and, as you will see, there are some pretty hard problems that must be defined and solved before we can come anywhere near building a *real* robot.

Historically, man has been preoccupied with building something that acts as he does for a long time. During the Middle Ages, Albertus Magnus designed an android butler that, when someone knocked, went to the door, opened it, and saluted the visitor. There is a story that Thomas Aquinas, in a fit of anger, destroyed the butler. In the late 1700's, a contrivance called "The Draughtsman" astounded King George III and Queen Charlotte by sketching them on the spot. (Such machines were, as we say today, preprogrammed). Then there was Baron von Kempelen's chess-playing Turk which defeated even Napoleon. The Turk specialized in frustrating chess champions until Edgar Allen Poe deduced its secret: a human midget in its innards, manipulating the Turk's arms. While the Turk was a hoax, the 1914 chess machine of the Spanish inventor, L. Torres y Quevado, was not. His mechanical champion played the relatively simple end game of king and rook against its human opponent's king.

Today, machines play chess at an above-average level, even winning trophies in some amateur tourna-

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ments. They also play bridge, which is a more difficult game in that it does not have a fixed algorithm. There are, moreover, machines which are endowed with humanlike qualities other than the playing of complicated games: machines exist which can perceive, plan, learn, read, hear, love and hate, create. But these machines are highly specialized, each is designed only to do one certain task in one very narrow area of specialization. For example, we can build a machine with arms and hands which will easily lift 1500 pounds. But no one even knows how to begin thinking about a machine that "is capable of wrenching a stubborn cap off the catsup bottle and that can *also* bathe a baby without either crushing, tearing, or dropping it." Today's limited technology—and perhaps limited imagination—have led to fragmentation. The machine which opens the catsup bottle does not lift weights, and vice versa; the machine which plays chess cannot play checkers, even though the latter is a far easier game, and neither can play ticktacktoe, which is the easiest of all; the machine which can read a printed "Z" with ease cannot read a handwritten "Z," et cetera. Everything we have now is far too specialized. This is in contrast to the human mind--or body—which is marked, not so much by its brilliance at any one task, but rather by its ability to do many different things.

The fragmented approach toward constructing something lifelike has essentially gone in two directions, one biological, one psychological. Those following the latter approach try to model man's psychology "heuristically." The idea is to figure out just what it is that makes a man decide, in a certain situation such as a chess game, to do as he does, and, then, on the basis of this, write a program to get a computer—or, perhaps eventually, a robot—to do the same.

The biological approach hopes to imitate life through the direct modeling of nature, and these so-called "bionicists" follow the ancient imperative, "Know Thyself." This approach is well illustrated in a story about the famous mathematician John von Neumann who was once talking to a large group about computers. When he finished, the inevitable question was raised, "But, of course, a mere machine can't really *think*, can it?" To which von Neumann replied, "You insist that there is something a machine cannot do, but if you will tell me *exactly* what it is a machine cannot do, then I can always make a machine which will do just that." And, herein lies the problem, say the bionicists. The deep gap between a man's thinking and that of a machine represents, in part, our ignorance about how a man thinks. Likewise, many of the attempts to build machines that talk, read, move large and small objects, et cetera, have, bionicists claim, bogged down because no one really knows how man manages to perform these tasks as efficiently as he does.

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Much of the bionics and heuristic programming research today, which might be applicable to the formidable task of robot-building is motivated not so much by any desire to create robots, but by a desire to better understand how a man is put together. Such research, optimists say, can be turned to robotry if not tomorrow, then the day after tomorrow. Pessimists point out that the current emphasis on building a robot by imitating man may be a case of barking up the wrong tree. In analogy, man did not learn to fly by mimicking our feathered, wing-flapping friends, but instead he learned to build airplanes whose only resemblance to birds is that they, too, are bound by aerodynamical laws. In the past, man has seemed to learn by studying puzzles, the abnormal things the pieces that do not quite fit, rather than by looking at normal, "well-functioning" systems.

The major problem in building a humanlike robot, as von Neumann was well aware, is one of making a machine which thinks. The term "thinking" covers a multitude of sins. At the one extreme is the logical manipulation of abstract symbols, such as involved in proving Pythagoreus' Theorem or in working out aspects of quantum mechanics. Such self-conscious-activity, often referred to as "thinking of the highest order," may well be the simplest type of thinking to program, i.e., be able to build into a machine. Biological nervous systems do many other things than high logic; they regulate heartbeats and parasympathetic nervous systems, they perceive the outside world through the senses—eyes and ears, but more!—and they make adjustments to heartbeats, arm motions, and other things accordingly. All these activities are more or less subconscious and, as a result, less well understood, and it is thus much more difficult to conceive how a machine can be made to carry out these functions for its own benefit.

The main emphasis of this article is on what the progress and prospects are for programming thinking, both of the conscious and unconscious variety. Progress has been made, most particularly in the area of pattern recognition, which some bionicists and heuristic programmers feel may well be at the heart of human thought and intelligence. While it is not at first obvious, one of the most, if not *the* most, subtle and complicated types of pattern recognition, or thinking, is that occurring in the manipulation of objects. A man recognizes in his brain how hard he is throwing a baseball, and then his brain makes a judgment about whether the motions are too hard or not hard enough. All the neural signals coming in to the brain have to be monitored and when something does not "look right," a bell has to be rung and an adjustment made. It is quite amazing that all the complicated actions that go into adjusting motions for something like

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throwing baseballs at batsmen become, at some point, almost reflex action.

Making arms and hands, which can do the things a man's can, may thus be the most difficult of all tasks for robot designers, and we will begin by describing the better manipulative arms in existence today. As you will see, progress has been minimal in this area. We have done far better in our attempts to duplicate man's more conscious activities. Among the striking developments are the learning machines such as the perceptrons and the heuristic programs for playing games, proving mathematical theorems, analyzing geometrical figures. We will talk of these things in turn. There are, no doubt, those who would argue that building a robot has little to do with analyzing a triangle. But if a robot cannot recognize a triangular object, how then can he manipulate one?

Anthropologists are fond of saying that it is man's hands which allowed him to rise above the beasts.* Certainly, a lifelike robot would have to have something, if not hands, to grasp, hit, poke, and push, and something else—arms—to move the grasper and poker. Man's arms, which terminate in hands, can be thought of as a series of bones connected by joints capable of pivoting and rotating. To see just how complicated arms are, we need only look

*Imagine the difficulty a dolphin, for example, would have in developing a technological society.

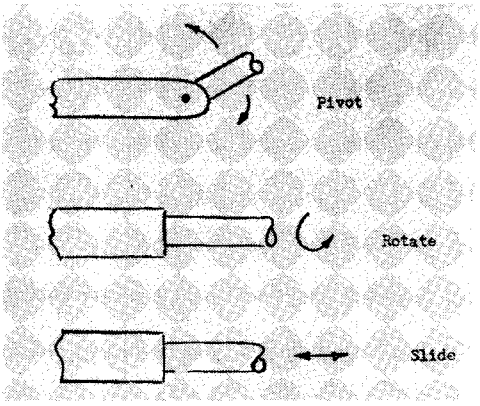

Fig. 1. Each of the kinds of joints depicted here lead to one degree of freedom; several may be combined in one arm to give greater freedom of movement.

at a "simple" everyday task like opening a gate. To begin with, something is needed to pull on, a handle of some sort. This handle is grasped, and the gate is swung open in an arc about its hinge. The arm and hand combination do not remain stationary through all this. Rather, the arm and hand must move *with* the gate in the same arc, but at the level of the handle and parallel to the plane of the ground. The nervous system backs up the arm and hand in their opening of the gate; it analyzes their speed and direction of movement, the force exerted, their position, and, as a result, the arm and hand are told rather exactly how hard to pull to get the gate open and yet not pull it off the hinges. This is feedback from the brain to the muscles doing the work.

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The human arm and hand do not have a large repertory of motions to perform such a task. In this Euclidean world of ours, three degrees of freedom are needed to move the hands to the place in space where they are wanted; these three motions are defined by the three familiar coordinates, "x," "y," and "z." Orienting the hands calls for another three degrees of freedom; a similar movement is seen in an aircraft's aerobatic roll, loop, and spin. While these "basic six" are sufficient to raise and orient a desk drawer to its slides, a seventh degree of freedom is needed to grasp it so that it can be opened or closed. In mechanical arms, a single hinge, pivot, or sliding joint each lead to one degree of freedom, as in Fig. 1—and several may be combined in a single joint. This requires a complex array of wires, cables, hydraulic lines, and other signal conveyors. Nonetheless, the resultant tongs, which are employed in present-day industry, are at best crude caricatures of the highly sophisticated human arm. Only a few types of arms have emerged, and these are shown in Fig. 2. Hands are in an even more primitive state: most are simple pincer or vise-type devices where two opposing flat surfaces converge on the object to be grasped.

The industrial robots of today limit themselves to simple kinds of strictly repetitious tasks such as lifting and loading—in, for example, the die-casting industry—and they look more like machine tools than anything else. Versatran, for example, is a tubular horizontal arm mounted on a box. It can move twenty-pound loads around with ease, seldom miss-

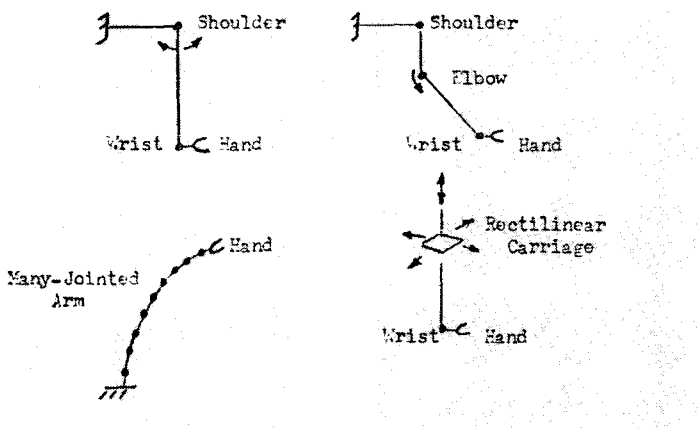

Fig. 2. Only a few types of manipulative arms have emerged, and the more-frequently used types are shown here.

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ing the spot by more than 3.2 millimeters. In one hour, Versatran can transfer as many as 1,200 of these loads. If taken by its mechanical arm and led through an operation, Versatran will be able to repeat the said operation by itself. This robot arm has what is called "continuous path control": it operates continuously as does a human arm, rather than moving from Point A to Point B to Point C with appropriate pauses in between. With "point-to-point control," a larger industrial robot, Unimate, is less adept. Weighing in at about 3,500 pounds, Unimate looks something like a tank with a revolving turret and gun—the arm. Unimate's saving grace is its long memory. While Versatran can record only 12 sequential motions in its main memory bank, Unimate can record 200.

Unimate and Versatran serve their purpose well, but no one could call their mechanical arms sophisticated. This lack of sophistication comes, in part, from the fact that no one knows how to tell an arm and its hand, "Stop, you're pulling the gate apart." Many of today's more interesting machines simply avoid the feedback problem by designing a "man in the loop." Thus, it is the man's eyes and ears and sense of touch which provide the mechanical arm with the necessary kinesthetic information.

One such machine is General Electric's Handyman, which was produced in the early Sixties. Handyman was the first electrohydraulic master-slave, being run by a man in a harness. Electrical signals pass from the harness to Handyman, and its arms and hands mimic its master's. If the harnessed man twirls a hula-hoop, so does Handyman. The slave has articulated arms—arms which conform to the operator's—and prehensile, or grasping, hands with independently controlled, opposing fingers. Although Handyman was never widely used, the technology pioneered in building this slave has found its way into other designs. Of particular importance is Handyman's dexterity, which can be traced to the fact that each arm and hand together have a total of ten degrees of freedom: shoulder (2), upper-arm twist (1), elbow (1), forearm twist (1), wrist (1), hand (4).* Handyman, when installed in a "hot" cell, an area for materials manipulation in a radioactive environment, works as well as a man wearing mittens. The slave, moreover, is quite strong: when it extends its arms outward as far as they will go, they can still, in this weakest of all positions, lift 75 pounds.

The ten motions are actuated hydraulically by means of the electrical signals which pass from the man to the machine. An electrohydraulic servomechanism is responsible for *each* degree of freedom. The arms "know" it is time to begin working

*In comparison, a human hand can make 22 separate movements.

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when the electrical voltage signal from the sensors in the harness increases. The hydraulic system acts, in a figurative way of speaking, to relieve the "pressure," i.e., it responds in a way so that there is a diminished electrical signal which only happens if the system follows the motions of the man in the harness.

Unfortunately, designing a "man in the loop" in this manner leads to a new set of headaches. A man moving a heavy load via a machine like Handyman must concentrate hard on what he is doing, and, no matter how intense his concentration, he cannot operate all the motions of the arm simultaneously. Practically speaking, a man can only consciously coordinate three motions at once * The result is a sluggish arm, which would become even more sluggish if, for example, a man sitting on Earth tried to manipulate Handyman and its load on the Moon. There is a three-second time lag in Earth-Moon communication, which leads to the frustrating situation of an operator on Earth not being able to see what he is doing on the Moon, but only what it was he did ** Three seconds is a long time indeed time enough to walk off a cliff. Add to this the fact that no one understands how a man—"the blackest of all black boxes"—and a machine interact—"the man-machine interface"—and the result is a less-than-satisfactory design.

It was these kinds of problems that inspired General Electric to put Hardiman on the drawing board in 1966. Hardiman is the first of a new breed: a powered framework of mechanical muscles, or exoskeleton. In contrast to Handyman, where the man controls the machine from a distance, Hardiman is operated on the spot: a man dons the exoskeleton and becomes a "Super-Man." With Hardiman's help, a man can lift 1,500 pounds six feet and carry this load 25 feet in 10 seconds, walking at a nearly normal speed.

An exoskeleton is built in two halves, and one of the early unpowered versions was jointed together at the hips by a "girdle," a pair of leather straps. The purpose of the girdle is to insure that the exoskeletal limbs move in unison with those of the wearer. Hardiman is actually a two-layered skeleton: the inner layer, which is strapped to the man, telegraphs sensory messages to the outer layer which is hydraulically powered and which does the heavy work. Since it is possible for Hardiman to drop a 1,500-pound load on its man-operator, the man must be aware of how large the forces involved are and where they are, via feedback from the outer skeleton. If too many forces are reflected back to the man, however, he becomes exhausted. The problem of how much

*On-line computer control can speed things up, until problems occur. Then, the computer calls for human help, and a man steps in and manually controls the manipulator until things are again running smoothly.

**For example, still pictures, which took one minute to develop, were the only feedback to the operator from the Surveyor Moon Diggers, crude shovel devices with four degrees of freedom.

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awareness is enough is a tricky one indeed.

These types of machines with arms are the *best* we have today. The new designs coming off drawing boards lean towards having man as the prime mover of the mechanical arm, for no one knows how to put together circuitry which can provide feedback.

It is far, far easier to build a machine to recognize simple patterns such as the letters of the alphabet—to model epistemological processes—than to build a machine to play basketball, or to run a bulldozer over rough ground, or to write a letter of the alphabet—to model physical processes.* One reason why a machine which can differentiate the letters of the alphabet is so much simpler to build is because it does not involve feedback to some limb performing the action: it simply has to tell an "L," for example, from a "T" and store the information. At the next level of sophistication, there are machines which allow for some learning, which involves feedback of a fairly simple kind.

These pattern recognition machines are based on an analogy to the human nervous system, and they learn how to distinguish characters through a feedback system which reinforces correct answers and punishes wrong ones.

The best such machine we have today is of a type called the "perceptron" because it perceives. The first of these was designed under the direction of Frank Rosenblatt, a Cornell psychologist, and it could recognize all 26 letters of the alphabet. Rosenblatt thought of this first perceptron as a model, which explains how the human brain, aided by the eye, works. The perceptron has three layers of "cells." The outer sensor, or S-cells, comprise the "retina." A-cells make up the next layer, and they are connected to the S-cells randomly because, as some neurologists hypothesize, "God wired our brains in a random fashion."* The last layer consists of one or more R-cells, or response cells, which give the machine's answer. The R and A cells are connected by variable resistors, or memory elements. A simple perceptron is illustrated in Fig. 3, and this particular machine has nine S-cells, an equal number of A-cells, and one R-cell, with each A-cell being randomly connected to five of the sensor cells.

A-cell 1 is, for example, connected to S-cells 2, 3, 7, 8, and 9; A-cell 2 is connected to S-cells 1, 2, 3, 5, and 8. Each of the other seven A-cells is also wired to five S-cells, and these connections—many others are possible—are shown diagrammatically in Fig. 4-a. In each case, three of the

*As has been said, it is easier to imagine simulating a theoretical physicist who works with paper, pencils, and concepts than an experimental physicist with his large and complicated arsenal of equipment and manipulative techniques.

*It has been said that highly creative people have "an unextinguishable core of randomness," that is, they have a greater number of random neural connections.

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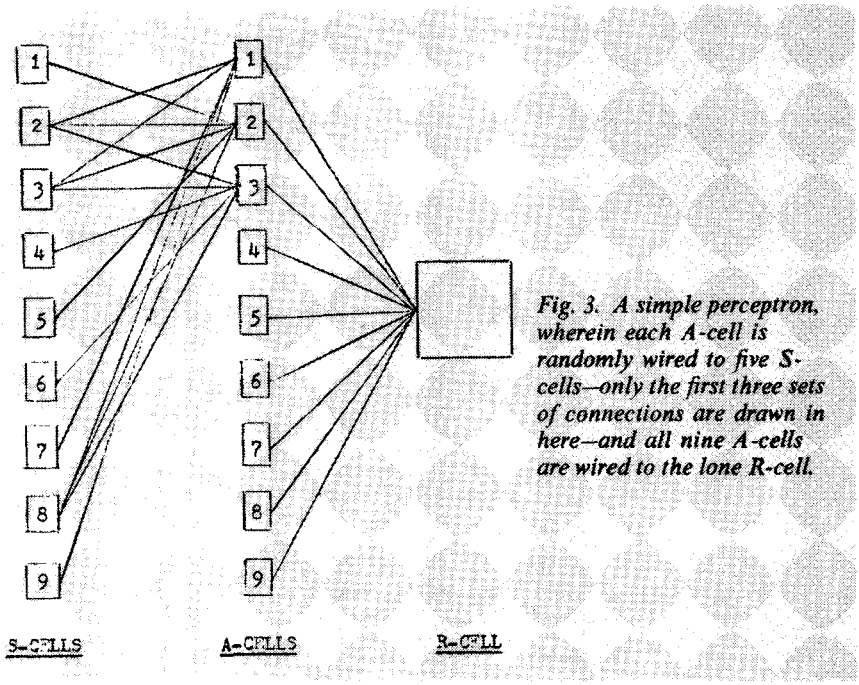

Fig. 3. A simple perceptron, wherein each A-cell is randomly wired to five S-cells—only the first three sets of connections are drawn in here—and all nine A-cells are wired to the lone R-cell.

connections are excitatory and two are inhibitory. The excitatory cell—labeled "E" in Fig. 4-a will, if shown something dark, give a positive signal (+1) and, if shown something light, no signal, or zero (0). The inhibitory connection (labeled "I") will deliver a minus signal (-1) if shown something dark and no signal, if something light.

The idea is to get each letter of the alphabet to elicit a unique electrical output from the perceptron. For simplicity we will only deal with distinguishing an "L" from a "T," and we will assume these two are black letters printed vertically on a white paper. The machine will see the "L" as if it were drawn on a piece of paper divided equally into nine squares. Such an "L" would occupy five squares, and these five squares can be identified by numbering them 1, 4, 7, 8, and 9.

The perceptron's nine sensors will now look at this letter, sending on an appropriate electrical signal. We are going to look at the signals the A-cells will receive when the S-cells are looking at an "L," according to the particular wiring scheme in Fig. 4-a. A-cell 1 is, as was said before, wired to S-cells 2, 3, 7, 8, and 9. The excitatory connections (2, 7, and 9) can

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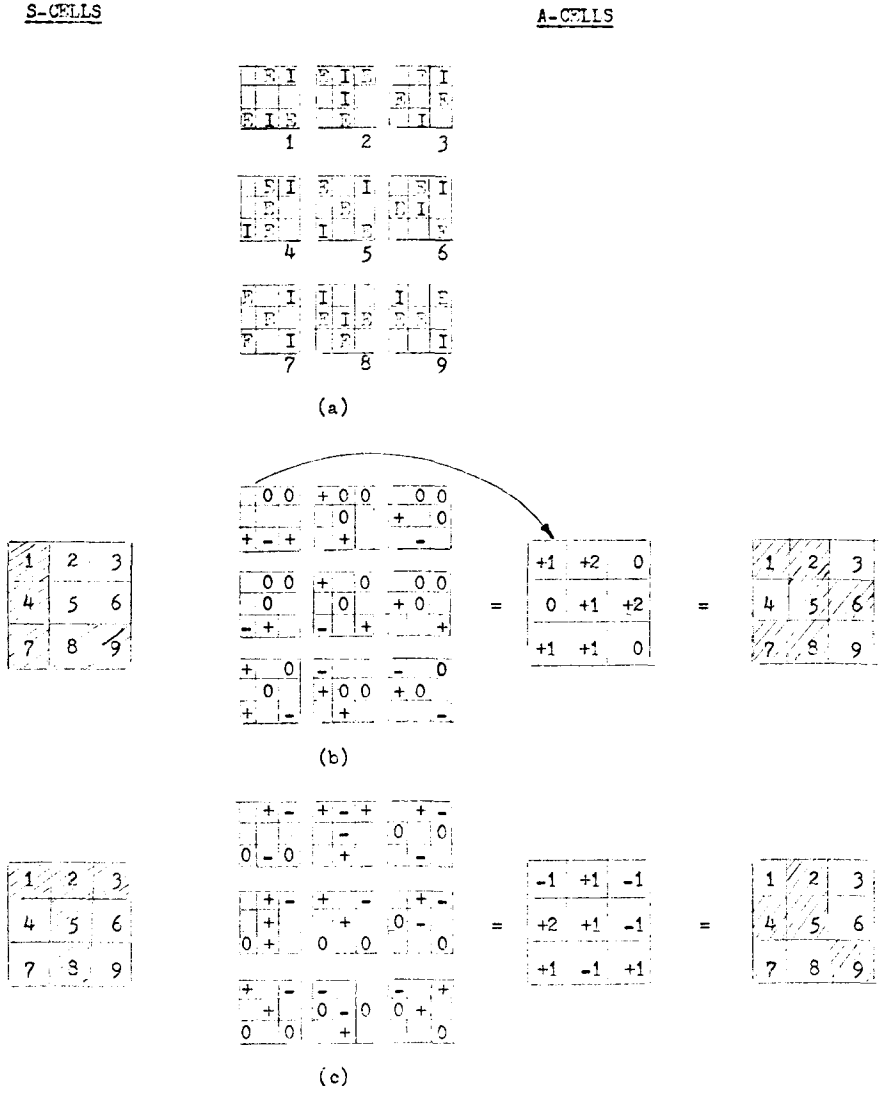

Fig. 4. Perceptron connections from the A- to S-cells are shown in (a); the way a perceptron interprets an "L" pattern is depicted in (b), and a "T," in (c).

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give rise to a positive or a zero signal. Connection 2 passes on a zero signal. S-cell 2 saw a light area. (See Fig. 4-b.) Connection 7, a positive signal. S-cell 7 saw a dark area, or part of the letter. Connection 9, a positive signal; S-cell 9 saw dark. The inhibitory connections for A-cell 1 are 3 and 8. Inhibitory connections lead to negative signals or zero signals. Therefore, there is zero signal in the 3-spot of A-cell 1 and a negative signal in the 8-spot. Totaling up these five signals gives a +1, which is greater than the threshold of +½. Thus, A-cell 1 turns on. A-cell 2 will also turn on since it has received a +2 signal, as will A-cells 5, 6, 7, and 8. A similar situation depicting what happens when the S-cells see a "T" is illustrated in Fig. 4-c.

Note that the array of A-cells which fire when shown an "L" or "T" need not *look* like an "L" or "T." The perceptron has no notion in its guts of how letters appear to us, and this is one criticism many people level at these machines. At this point, an "L" and a "T" can be told apart if the R-cell fires when six A-cells are lit up, but not five. And they are distinguished *correctly* if the meaning of its firing is "L" rather than "T." But the randomness of the wiring between S- and A-cells does mean that, at least at first, the R-cell will not *a priori* know what the A-cell pattern will be. It might have been that the R-cell was set up to fire—answer "L" when more than five A-cells are lit up. In the case discussed above, all "T's" would be correctly identified, but all "L's" would be incorrectly identified as "T's". To get the right answers every time, the machine has to learn how to distinguish the A-cell patterns in a way consistent with the way the R-cell was set up in the first place.

Today's learning machines nearly all use weighting units, or variable resistors, to train the machine. Results are fed back into the machine, and the weights changed before the next go-around. In this way, the machine's performance is improved. Let's see exactly how this all works. Suppose we had set up our simple perceptron's single R-cell to mean "T" whenever it is energized and "L" whenever it is not. At first, all nine A-cell signals are weighted equally—the resistance values of the "memory elements" are all the same—let us say at 5 units each, and the threshold value of the R-cell is then set at 25. If this value is exceeded, the R-cell should give us a +1 answer—a "T"—if not, a 0 answer—an "L".

Now suppose the perceptron is shown an "L." If the machine replies correctly; i.e., with a 0 answer, we are in good shape. But instant success would not be ours if the machine were wired as in Fig. 4. Adding up the energized A-cells (1, 2, 4, 5, 6, and 7), each weighted at 5, gives a total of 30, as in Fig. 5. This is greater than threshold, +25, and a wrong answer since the perceptron is

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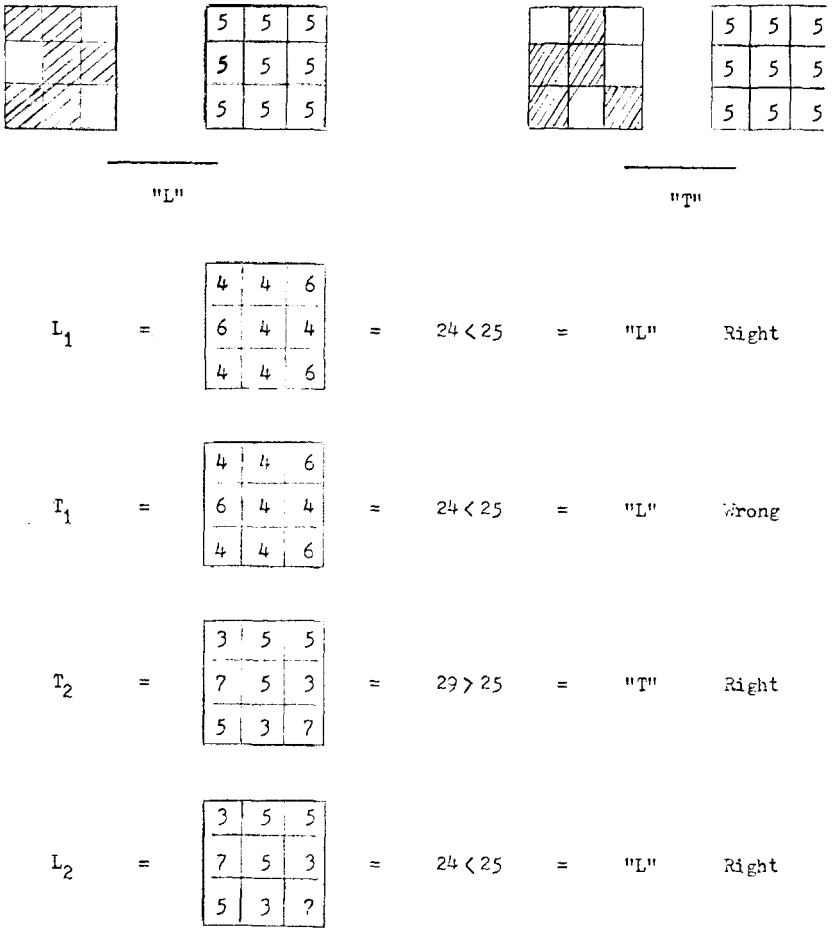

Fig. 5. Training the perceptron to learn to recognize a "T" and an "L" pattern by fiddling with its weighting units (variable resistors).

set to respond "T" in such a case. Before proceeding further, the thing to do is to see if the perceptron can recognize a "T," i.e., will answer +1 when shown this letter. Adding up the weights for the A-cells (2, 4, 5, 7, and 9) which have been turned on, we have a total of 25, or a +1 answer, which is what we wanted. The perceptron can already perceive

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"T's" correctly, but it must be trained to identify an "L" pattern.

The perceptron is trained by fiddling with its weighting units. The perceptron said "T" when shown an "L" because the sum of weights the R-cell sees was too *large* a number. Thus, the weights of all the paths to the energized A-cells are *decreased* by 1, and all other weights are increased by 1, giving us a new picture. This new picture, as in Fig. 5, can be called L_2, and it depicts the input to the R-cell when it is shown another "L." These adjustments are not done manually—it would be a heck of a wiring job if they were. Rather, the machine is manufactured in such a way that weighting, rewarding and punishing, can be accomplished by pushing a button. Totaling L_1 gives $L_1 = 4 + 4 + 4 + 4 + 4 + 4 = 24 < 25$.

The R-cell doesn't fire; the perceptron is answering "L," which is correct. But, in playing with the weights, did the perceptron forget the "T" pattern? To find out, T_1, which uses the *same* weights as L_1, must be considered. Summing the relevant numbers for the energized cells (i.e., 2, 4, 5, 6, and 9), as in Fig. 5, gives

$T_1 = 4 + 6 + 4 + 4 + 6 = 24 < 25$,

which means that the R-cell doesn't fire. The perceptron must thus be retrained to perceive a "T" pattern. The answer was too small, and, as a result, the connections leading to the energized cells are increased by 1, and the others decreased by 1. T_2 gives

$T_2 = 5 + 7 + 5 + 5 + 7 = 29 > 25$,

which means the R-cell will fire, and, hence, is telling us it sees a "T," which is the answer we wanted. The last step is to recheck to make sure the perceptron remembers an "L." L_2, using the weighting numbers generated in the previous try, gives

$L_2 = 3 + 5 + 5 + 3 + 5 + 3 = 24 < 25$.

The R-cell will not fire; the perceptron has been trained!

Rosenblatt's perceptron, the Mark I, was, of course, far more complicated than this. It had 400 photo cells as S-cells, 512 A-cells, and 8 R-cells. S-cells were connected randomly to as many as 40 A-cells, and all 512 A-cells were hooked up to the R-cells. With this large array of cells, the Mark I Perceptron could read the entire alphabet, and, interestingly enough, it went right on reading even when some of the A-cells were out of whack—as, in analogy, the human brain goes on working when some of its neurons are disabled.

Perceptrons are many-faceted machines. They are somewhat self-organizing in some sense of the word. That is, they can recognize improvements when they find them.* Some can, moreover, generalize in some sense of the word, that is, they can classify new patterns on the basis of their similarity with stimuli in the learning—conditioning—sequence.

*No machine today can work any genuinely important change in its own basic structure, and, to many, self-improvement seems the obvious path to intelligence.

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Generalization is the ability to recognize a coiled rattlesnake as a rattlesnake whether in a forest or a city park and to know that the snake is still dangerous. Such a pattern recognition ability is quite necessary for survival.

Speech recognition is yet another kind of pattern recognition faculty of man that would be desirable in a mechanical worker, but it is in quite an unhealthy state compared to visual perception. A machine that recognizes simple speech, the numbers "oh" through "nine" has been built. As long as the *same* person speaks to the machine in the *same* tone of voice, it can identify a number with ease. But if this person becomes angry, or if another person speaks to the machine, things fall apart. This is one of the frustrating things about auditory patterns. A "damn" said on Monday may look totally different from a "damn" said on Tuesday, and both may appear different from Wednesday's "damn." On the other hand, all three could look alike: it all depends on one's mood.* The human brain knows what a "damn" means when it hears one, but will a machine?

Since no one seemed to be getting anywhere in the speech recognition field, people turned to handwriting recognition with the hope that this might provide some clues to speech patterns. The two seemingly diverse areas are similar in that both are highly individual expressions of language, and language imposes a very large barrier between man and the machines we have today. Not only are there huge differences between different handwriting–speech–samples, but there are also differences in the same person's handwriting–speech. This has so far turned out to be something of a dead end, for most of the handwriting recognition schemes today are only at the stage of being laboratory toys.

At this point, it seems impossible to recognize handwiting patterns unless the computer sees the words being formed, since most recognition schemes rely on time information. Seeing a word written gives the computer a headstart in identifying it; the writing process yields clues about the letters–what, where, and when lines are formed. If, however, the computer is only exposed to the finished "d" or "b," how can it tell them apart? For, both have the same elements, i.e., a straight line with an accompanying loop and a closed curve. While children often confuse their "d's" and their "b's," eventually, most people are able to distinguish between the two patterns and in varying contexts. If for some reason, "b's" and "d's" were to be transposed in a sentence—"Dab doys beal carbs unberhanbeb"–the human mind can see the pattern error and break the "cobe."

*Only a small portion of the total energy used in human voice output–perhaps as little as one percent–is used for the message bearing signal. The remaining energy goes toward producing extraneous characteristics of the voice, which identify the speaker's sex, his health, his mood, et cetera.

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In an attempt to understand more about how the human mind can do such things, a lot of grown men have been spending a lot of money and time playing games in the past few years. One game which has come in for a good deal of attention is checkers, which seems a simple game, but is not. To figure out every possible move in checkers would require playing 10^{40} different games.* The almighty computer cannot win a checker game by "brute force" alone, for even if a computer were to play a million games a second, this many games would take 10^{34} seconds. One checker game would thus require about 10^{27} years to complete, which is a hundred million billion times the age of the universe.

Because the tree of all possible inferences is so large, heuristic programming has been used to devise winning strategies which do not involve checking *all* the possible moves, but just the more likely ones. One computer program developed by Arthur Samuels at IBM plays extremely good checkers; it beats Samuels himself. The program uses partial analysis of certain features of the game, features such as the number of checkers each player has on the board, how advanced they are, et cetera. The program, however, does not stop here; it also explores some of the consequences of possible moves. Thus, its moves seem to be made as though they were planned, i.e., the computer looks ahead—"thinks"—a certain number of moves, as does a person.

In the beginning, the rules of checkers are put into the program so that the computer can check all moves and contemplated moves for legality. To remind the reader, the game of checkers is considered won when one player has blocked the other, that is, a player has boxed in an opponent so that no further moves can be made—or, alternatively, taken all the opponent's men. Let's play checkers now, letting the computer take the first turn. It only knows the position of the checkers on the board at a particular moment in time—now. It, therefore, calculates what might happen if it made *all* the moves it legally could. This stage of the game is shown in Fig. 6 and labeled Play 1. Play 1 is a summary of all possible board positions after the computer has taken its turn. Next, the computer figures out how its opponent could react if it moved in any of the ways projected in Play 1, and this calculation is Play 2. The computer then determines Play 3, which is how it could respond to any of its opponent's moves. At this point, the computer becomes somewhat more selective. From a given point on the "tree"—board position—it will look ahead to Play 4 only if it can answer "yes" to one of three questions:

1. Is the next move a jump?
2. Was the last move a jump?
3. Is there a possibility of an exchange offer?

*To digress: This number swells to 10^{50} different games.

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To go beyond Play 4, the computer must be able to reply "yes" to either Question 1 or Question 3. It continues past Play 5 only if Question 1 can be answered "yes." At Play 11, it stops if either it, or its opponent, is ahead by two kings. And, it will never look further ahead than 20 plays—for reasons of time and available core storage.

With this information in hand, the computer is now ready to make its move. But how to choose among the alternatives? First, the computer searches the decision tree to see if any of the moves it could make at this moment would lead to the blocking of its opponent. If so, it proceeds to block its opponent—and win the game. If not, it decides what to do on the basis of a polynomial scoring equation of the form,

Score = $ax_1 + bx_2 + cx_3 + dx_4 + ex_5 + fx_6 + \ldots$

The "x's" represent different objectives such as that of piece advantage, maneuverability, et cetera. The coefficients in the scoring equation are plus or minus numbers, which are larger or smaller, depending on

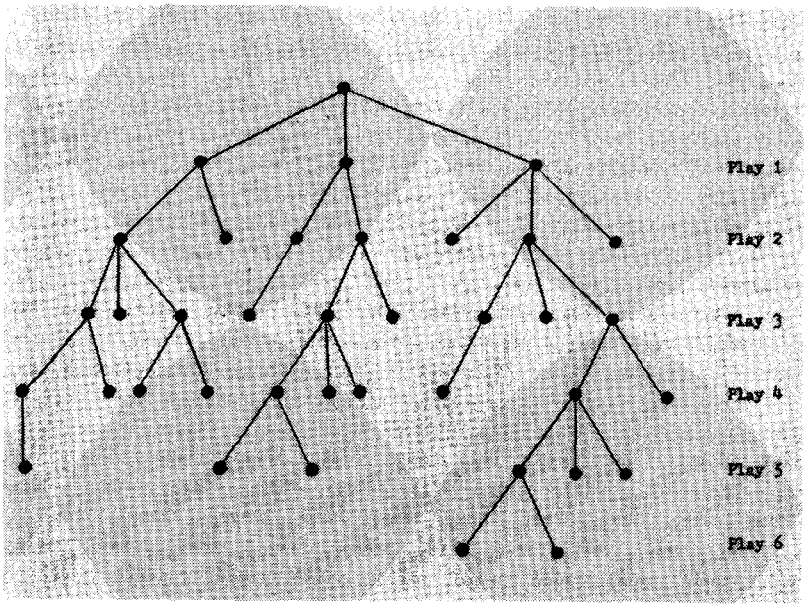

Fig. 6. In playing checkers, the computer "thinks" ahead a certain number of moves. Play 1 is a summary of all possible board positions after the computer has moved. Play 2 is how the opponent might react to Play 1. The computer must be able to answer certain questions in the affirmative to proceed beyond Play 3.

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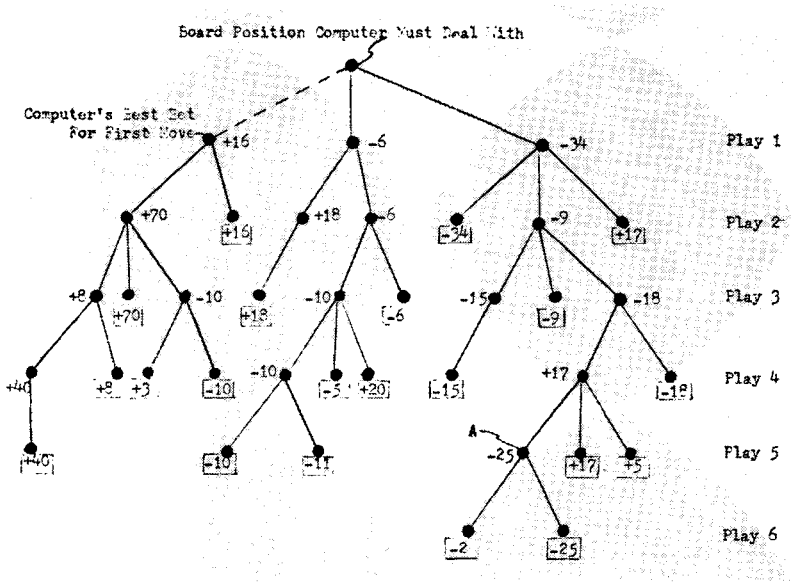

Fig. 7. Assigning numbers to the tree of possible inferences for a checker game. The boxed numbers are assigned on the basis of the scoring equation; unboxed numbers are junctions, or decision points.

how important a particular objective is considered to be in winning the game. The computer discovers the value of these coefficients through trial and error. Samuel's computer learned to play checkers by working through championship games recorded in books.

On the basis of the scoring equation, numbers are assigned to all the end points in the decision tree, that is, those points when no more moves are possible. These numbers are shown in Fig. 7 as boxed numbers. From the boxed numbers, by working backwards, tracing back to the trunk of the tree—the computer can decide what numbers to place at the junctions: junctions are decision points, those points in the tree where alternative moves are possible. When it is the computer's turn, it selects the largest possible number for placement at each junction since if it found itself in that situation it would obviously make its move in that direction. When the computer "takes a turn" for its opponent, it assigns each junction the smallest number: the computer assumes its opponent is smart enough to choose the move least advantageous to the computer.

Now, we can see how the computer goes about filling in the junc-

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tions in the decision tree it has constructed. Play 6 in Fig. 7 shows the board after the computer's opponent has taken a turn. The computer* chooses the least favorable number, -25, for placement at the single junction labeled "A" between Play 6 and Play 5. Going up a level, it is the computer's move, and it picks for its three possible junctions, the three largest—i.e., most favorable—numbers: +40, -10, and +17. At the next level, the opponent's five junctions are assigned the smallest possible numbers: +8, -10, -10, -15, and -18. Back to the computer which, this time, has four junctions and which it subsequently labels +70, +18, -6, and -9. The opponent's labeling goes +16, -6, and -34. The tree filled in, the computer selects as its move the junction in Play 1 leading to the highest score, in this case, +16. After its opponent moves, the computer surveys the board positions and constructs a whole *new* decision tree. It continues doing this until, finally, the game is won.

Actually, the computer does not know how its opponent will evaluate a set of board positions; it has to assume its opponent is the expert. Thus, the computer is really searching to find out what the criteria—patterns—are for playing winning checkers and attempting to learn them as it plays. (The scoring equation is not a constant; it can change each time the computer uses it). If, for instance, the computer finds its human opponent throwing away men—to confuse the computer? out of stupidity?—it may have to reweight its criteria somewhat in order to "understand" its opponent a little better.

*This procedure is called "minimaxing" and was first suggested for use in chess and checkers by Claude Shannon in 1949.

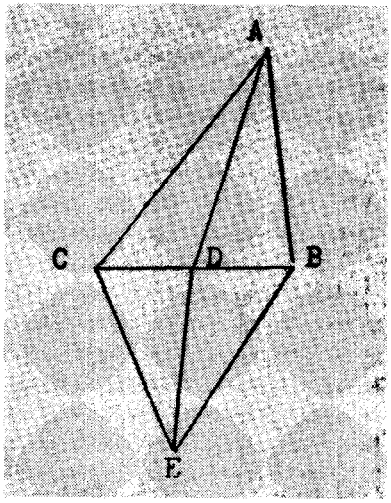

Fig. 8. The same sort of computer program that plays checkers can also be made to solve theorems on inequalities such as that pictured here, where one is asked to prove that the angle ACE is less than ABE.

One might think that playing games is not a serious business. But a similar kind of program can be used to prove geometrical theorems* such as: Given an isosceles triangle ABC with a line intersecting the base BC

*Yet another program, the GENERAL PROBLEM SOLVER, was able to offer proofs for the "Principia Mathematica," and, moreover, some of its proofs were more elegant than the original ones of Whitehead and Russell.

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at the point D such that BD is less than DC, prove that the angle ACE is less than the angle ABE, as in Fig. 8. A decision tree for searching out the proof of this theorem on inequalities can be constructed by a computer.

The computer can equally as easily put together a decision tree to recognize analogies between geometric figures. One such program was written by a graduate student at MIT, and the form of pattern recognition is familiar to anyone who's ever taken an intelligence test. Two figures which are similar in some way are given, and one is asked to identify the same kind of relationship between a third figure and several choices, that is

A is to B as C is to
(D$_1$, D$_2$, D$_3$, D$_4$, or D$_5$)?

The geometric analogies used in this particular program came from a standard intelligence test, which most students take as part of the series of college admission exams. Such a test is ideal for attempting to imitate human thought because the "answer" is not just a particular number such as 137, and hence may give more insight into how the human brain has insights—as opposed to simply reckoning. The "correct answers" come from people who are considered more intelligent than average and who have taken the test. As a matter of fact, the program's developer could not predict the computer's answer.

The reader can tell at a glance what the correct reply is to the problem posed in Fig. 9. But let him try to analyze his thinking process: what things did he look at, what things did he compare, what sort of similarities were considered as relevant, and what dissimilarities were discarded

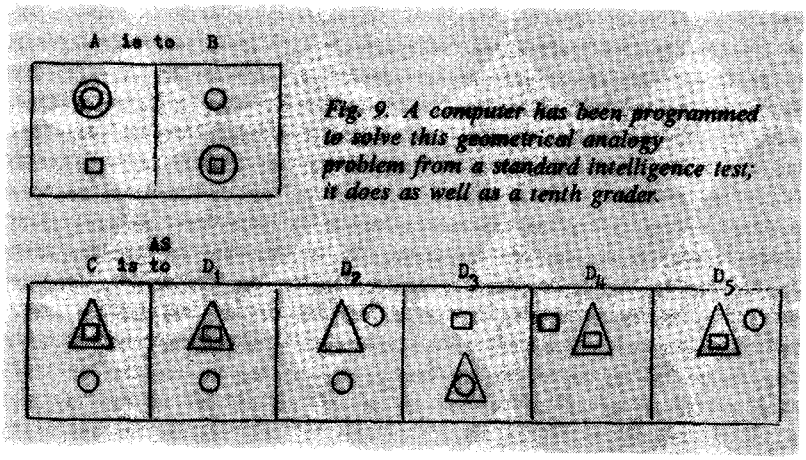

Fig. 9. A computer has been programmed to solve this geometrical analogy problem from a standard intelligence test; it does as well as a tenth grader.

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as irrelevant? He will soon discover that to describe his thinking process in precise words is no easy chore. Nonetheless, before this program could be written, its developer had to make a stab at verbalizing how an intelligent person might proceed.

On the basis of the answers to two questions ("How is A changed into B?" and "How is C like A?"), a program, which is as complicated as any today, was put together. First, the computer gets a geometric description of the given set of eight figures, translated, of course, into numerical terms that the computer can more easily understand. These descriptions in hand, it sorts out the topological and geometric relations between the parts in each of the figures. This involves discovering, for instance, that the square is below the pair of circles in A. Next, the program looks for similarities between the parts of each figure. In doing this, it takes into account whether there would still be a similarity after a 180-degree rotation of a particular part of a figure, or a reflection, or other kinds of symmetry checks that we, in our first glance, make almost subconsciously.

After listing the similarities between different parts of a picture, it lists the similarities between *pairs* of pictures. The program then makes up a hypothesis about how A is related to B. This involves listing the changes made in getting from one figure to another, i.e., the parts taken away, added, rotated 180 degrees, et cetera. In addition to listing the changed parts, the program also lists the characteristics, relations, and similarities already discovered for each of the separate figures in the D series. Using this hypothesis, the program then compares C to each one of the figures in the D series. Once it has tentatively located a figure which fits the hypothesis, it measures how well the pair C and the chosen D relationship compares with the A-B relationship. It successively ignores the details of the A-B relationship, one by one, until the two relations—A-B and C-D—are alike.

This program shows the intelligence, insofar as geometrical pattern recognition goes, of someone in the tenth grade. The depth of its reasoning power can be seen from the example in Fig. 10, where the program identifies "the global aspects of a situation." It is able to recognize two overlapping objects, a square and a triangle, for what they are, as in Fig. 10-b, rather than separating them into pieces, as in (c). The program's weak spot is its inability to cope with relations more complicated than those shown here, for instance, those among four separate objects, or sets of objects.

A similar type of theorem-proving program, known as RESOLUTION, is responsible for an explorer robot, developed at Stanford Research Institute. This robot—and others like it—can sense, map, and navigate in totally new environments, and in the sense that it is somewhat indepen-

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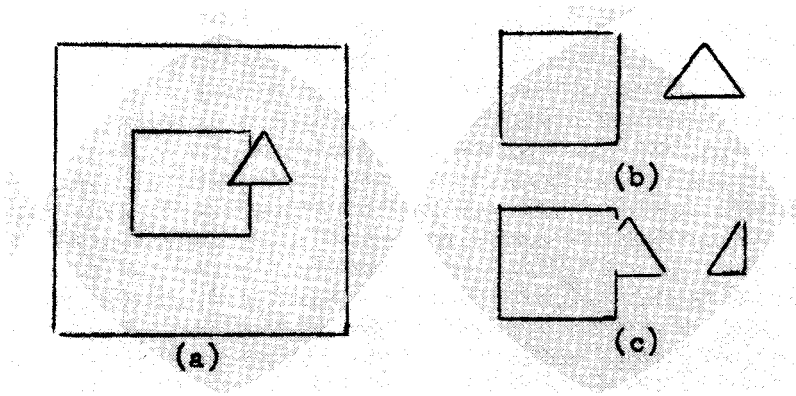

Fig. 10. The depth of the reasoning power of the computer is shown here, where it separates the overlapping figures in (a) into their constituent parts as in (b), rather than into (c).

dent, it is probably the *most intelligent* robot we have today. The robot is mounted on two computer-controlled wheels, and it can move forward or backward, and turn left or right, pushing objects around with ease. Its nervous system consists of tactile sensors, an optical range-finder, a television camera, and a navigation system. The robot's environment is a large, well-lit room full of geometrical objects such as cubes and squares. A typical task given the robot is: Go to point (x_1, y_1) and then push Cube A to point (x_2, y_2) and Cube B through Doorway D. When asked to perform some such action, the robot uses its present state as input "axioms" and the desired final state as a "theorem" to be proved. In proving the theorem, intermediate steps in the proof generate commands to the robot. When the theorem is finally proven, the computer has progressed to its corresponding final state. In such fashion, this robot explores its surroundings, bit by bit, until it has a map of the whole.

We have looked at a number of the problems involved in trying to build a humanlike robot. We have seen that the approaches to what might be called "static" pattern recognition—such as recognizing "L" from "T"—and theorem proving from those patterns—such as winning at checkers—seem to be generally in better shape than the more unconscious "dynamic" kinds of pattern recognition—such as opening a gate. As there is, moreover, no integrated approach to robot building, the prospects for a friendly mechanical companion in the near future seem remote.

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One of the interesting—frustrating?—things is that everything discussed here depends in one way or another on computers. Even the perception is a computer, albeit a randomly hard-wired one based on a neural analogy. There are those who, in looking toward the day of human-like robots, regard the digital computer and its artifical languages as villains. "It would be hard to imagine a device more admirably unsuited for imitating the brain," says one critic. While digital computers are thought of as being general-purpose machines, they are designed so that they must work sequentially, doing first one thing, then another, then another. No matter if the sky were falling down, an IBM 360 series computer would continue plugging away at its pile of input cards—unless, of course, its electricity were cut off. If told to play checkers, it plays checkers, and it has but one goal, to win at checkers. In contrast, a checker-playing man may have many goals all at once: he may indeed want to win, but he also may be playing to win because he can't stand to lose, or to make friends with his mother-in-law who is a checker "nut," or to put off cleaning the garage. A man's mind is a beehive of activity with many things going on simultaneously. Not only is there feedback, but "feedforward," and "feedsideways."

With this in mind, computer experts have been talking about multi-layered computer programs or hierarchies of computers to emulate the complex layers of the brain. But so far the talk seems just that. An alternative is a Super-Computer, and there have been many estimates about how big such a computer, built with today's technology, would have to be to do all the complicated things that a man's brain seems to. One estimate is that a machine with even one-twentieth of the brain's capacity would occupy 20 barns. On the other hand, another more pessimistic estimate is that to build a robot with a brain like a man's, using the electronic components we have today, would take all the material available in the universe.*

For those who would have their robots, come what will—"machines are an expression of the human spirit"—there is possibly a way around these neuroeconomical arguments via improved technology. The brain packs 10^{11} components into an area about the size of a square foot box; the best microelectronics has yet been able to do is to put 10^{6} components into the same volume. Obviously, far smaller components would be a big step forward, but how does one go about building them? Circuits contain many wires, and, if the circuit is shrunk, so must the wires be. The smaller the diameter of the wire, however, the greater its resistance, and the less easily electrical current will flow through the

*Another way of stating the argument is that if a computer program which could act like the brain were written, it would take all of eternity to debug it.

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wire! A number of people have proposed electronic components which would presumably avoid this dilemma, but no one has been able to conceive how to build one.* and so the idea waits

Yet another alternative might be to use the computers we do have in some *new* way, such as in the evolutionary approach to artificial intelligence. While this approach has only dealt so far with simple problems, it seems, nonetheless, to many, to be far more promising than bionics or heuristic programming. The people who are trying to simulate the mind through evolution regard man as but an artifact of evolution, and they ask not what man is today, but what he might be someday in the future. They argue that man does not learn by directly imitating nature, and they point to flying as an example. The evolutionary people would say that we should keep our eye on the future: just because our whole society revolves around two-legged creatures who walk, this does not mean that this is the most efficient means of propulsion. Perhaps the man of the future might evolve into a three-legged creature or a creature who "thinks" himself from place to place.

The organism these people are evolving is not a thing, but a mathematical entity in a computer program. Survival of the fittest is the key here, as in Darwinian evolution. For this algorithm, survival means the ability to solve a given prediction problem, namely, how to respond to its mathematical environment. After its ability to do this is measured, the organism gives birth to another, different from itself. That the new organism is indeed a mutant is guaranteed by the introduction of randomness, or noise, into the computer program. The offspring's abilities are then measured, and if it does better than its parent, it survives. If not, the parent survives to spawn another offspring. The stronger becomes the parent of the next generation, and, thus, a "heredity of reasonableness" is carried on.

This evolutionary program is designed so as to resemble Darwinian evolution as closely as possible, and, as a result, a niche is assigned to some of what seem at first to be "second raters." If, at a later time, "recessive genes" come to the forefront in this family, and the offspring seems more adaptable than the parent or grandparent, it survives. And sometimes surpasses its peers.

Perhaps then computers can be built by and from computers. "And, thus, it came to pass that in the year 1984, Computer and Program Mark 2021 begat Computer and Program Mark 2022." ■

*Large scale integration (LSI) is currently being heralded as an eventual solution to this problem. By stacking very thin layers of semiconductor material on top of each other, as many as about 50 transistors, 100 diodes, may be placed on a single chip as small as one millimeter square. Such devices moreover, have very low power requirements.

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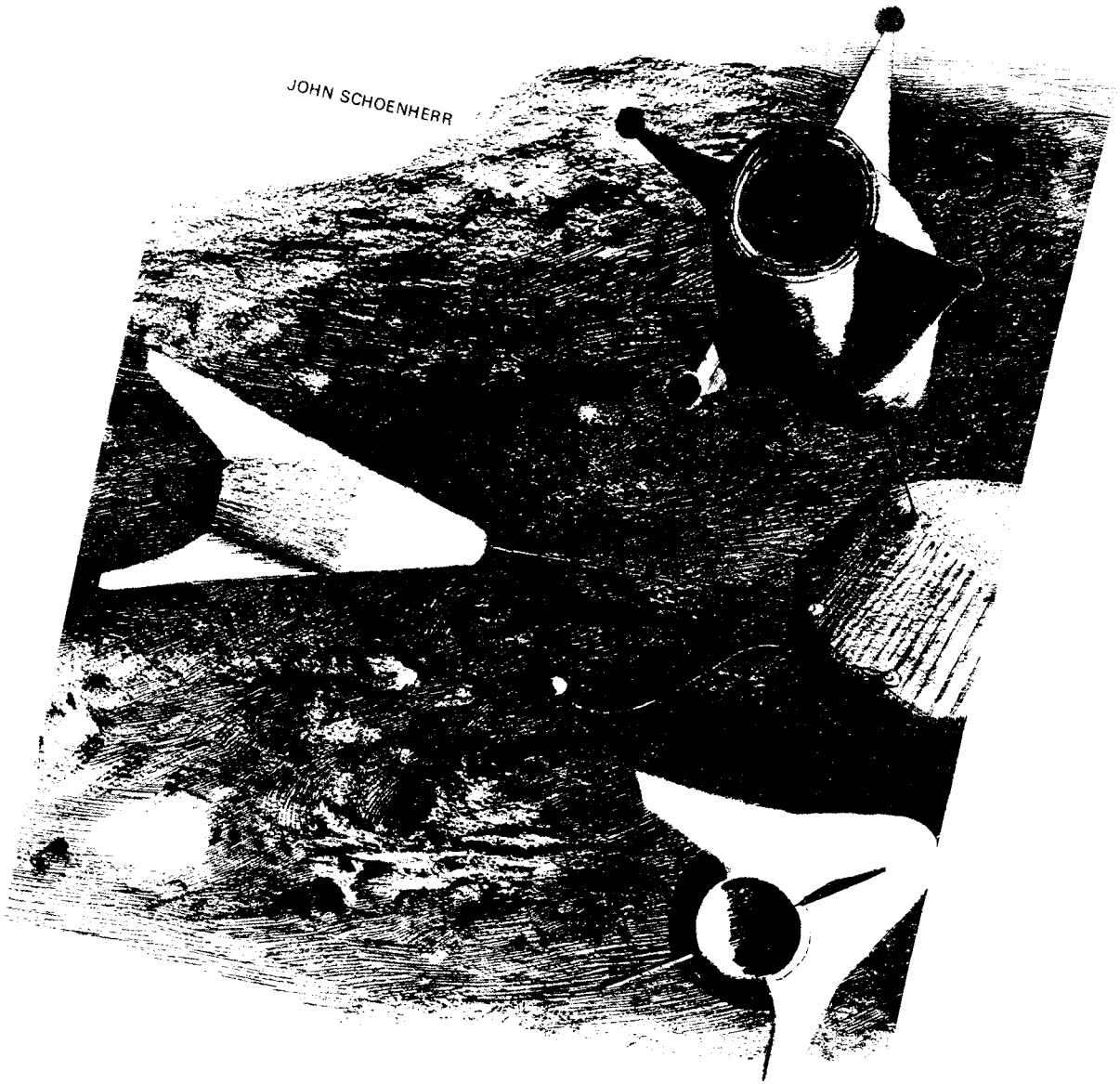

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Conclusion. Lorian knew Sixx and Lowry were spies. Sixx and Lowry knew he was wrong; they were jewel-thieves . . . in a way. But they were wrong, too, and Lorian was right . . . in a way!

Hierarchies by John T. Phillifent

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SYNOPSIS

The Crown Stones of Khandalar, one for each of the six Royal families of the Khandalar Three-World System, are tiny fire-red gems which, in the hands of a Royal, confer genuine mind-power amplification. Together with other "power" devices they are legacies from the past, have maintained absolute power within a feudal system that has long since forgotten the technology that made them, a system that is now beginning to come apart as the result of contact with Earth. King-Emperor Lagas, desperately hoping to speed the switch from feudalism to democracy, has arranged to "lend" the Crown Stones to Earth for scientific study, in return for massive social assistance, and the assurance that the Royal "power" will be returned, fast, in emergency.

Jason Horn, Managing Director of Interstellar Security, conspires with Lagas to switch the Stones under the eyes of the Guard, replacing them with a fake set. He turns the Stones over to Rex Sixx and Roger Lowry, his top agents, for safekeeping, plus an extra fake set. The whole "power" is contained in an insulated cubical box, one inch a side, easy to conceal, but as a cover story Horn has also arranged for Sixx and Lowry to transport a female Royal "sorki," a prestigious pet animal resembling a small dog, which will be rare and precious on Earth. With Quema, the sorki, goes an expert keeper, Miss Elleen Stame, a gorgeous, but dim, Earthwoman. Horn departs by the fast route, leaving Sixx and Lowry to travel slowly overland to the sea and their own ship. En route they learn that Miss Stame is a refugee from a scientific expedition under Sir Bernard Monkton which was studying Khandalar ecology in an attempt to understand the established, but mysterious, longevity of the K. Royal families. This expedition was wiped out by bandits, Miss Stame managed to escape and make her way to the Royal Palace and get a job as sorki-expert simply because she is a natural mnemonic.

The travelers are attacked by bandits, but Sixx and Lowry, wearing I.S. "impregnable" suits, manage to save Miss Stame and the sorki, wipe out the attackers, proceed to a mid-point inn, and put up for the night. In the dark hours more bandits kidnap Miss Stame, carry her off to the hills. Sixx and Lowry rescue her, interrogate the bandit leader, uncover a conspiracy afoot to overthrow Lagas and his "foreign" interlopers; this movement masterminded by one Lorian-dis-Teltor, a renegade Royal who has had Earth education. By now the I.S. men begin to suspect there is more in this than appears on the surface. On their way again to the coast, Miss Stame confesses that Quema is sick, and nothing in her memory can explain it.

Safely aboard with their own I.S. Special "Clipper Ship," and properly into caravan under a warp-master, on the way home at last, the ship's computer, Joe, solves the mystery of Quema. She is pregnant, by a com-

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mon bassorki, and is about to deliver a litter at any time. Sixx quotes grimly "We of I.S. have never yet lost a consignment. We always deliver!" But this time . . .?

Part 2

Sixx sought his couch, and slow-coming sleep, in an evil mood. I.S. training was intended to equip operators with the resource to cope with virtually any extreme, but it was hardly surprising that the programme had not included anything quite so far-out as playing midwife to a rare, delicate and pure-bred alien animal, particularly one gravid with illegitimate offspring. And their given expert was worse than useless in the circumstances. Deliver! Stand and deliver. Establish a record. Be the first I.S. agent to report a flat failure!

His fitful sleep was peopled with horrible dreams of being pursued by a horde of hideous whistling monsters, each with a startling resemblance to Jason Horn, and he couldn't be sure whether they were grinning, snarling, or just showing their teeth.

He woke violently and precipitately to the yammer of alarms, grabbing for and scrambling into his safety-suit almost by reflex, slapping it together almost before his eyes were properly open, and long before his conscious mind could ask, coherently, what the hell had gone wrong *this* time? He galloped into the control room, still slapping at fastenings, in time to see Lowry come storming in from the opposite side, looking equally distrait. One fast glance at the screens was enough to make his hair lift.

They were in real-space, with star-images etching lines on the screen as the ship tumbled end over end. Of the steel-gray enigma of warp-space, and the warp-ship, and all their fellow travelers, there was no sign whatever. He fell into his chair and stabbed at the controls to kill the tumble, straining against the sudden impulse-thrust, nursing the studs until the star-images were steady. Then Lowry, from the other panel, gave a grunt.

"We have company. A big one. Left twenty-two, high twenty-six five."

"I see him." Sixx twirled the verniers to bring that other ship into screen center. At extreme magnification he could just make out a profile. And now he could also see a red flare, not too far away beyond that ship. A quick scan of his sensors told him they were in the vicinity of a small star-system.

"Hm-m-m!" he murmured. "That ship there looks like nothing I ever saw before, Roger. What d'you think?"

"New to me, too. Doubt if it can be one of ours. I'll try and raise him on radio, though I would reckon he's about as shook up as we are. What happened to our caravan?" As there was no forthcoming answer to that,

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he thumbed the stud and spoke into the microphone.

"Hello. What ship? This is *Clipper IV.* Do you read? What ship?"

They had an answer, of sorts. within five seconds. A yellow eye winked in the forward end of that ship, and at the same instant the Clipper bucked as if it had run into a rubber wall, the hull fabric creaking to the stress.

Sixx heaved back into his chair, sucked in a much-needed breath, and said, "Well, now we know, don't we? A punch-beam! They want to play games!"

"Easy on, Rex!" Lowry cautioned. "He can't do us any real damage with that pressor, except maybe push us around a bit. And we have fragile cargo. If we irritate him he may turn on something else."

"I suppose," Sixx sighed. "And we don't know what other little goodies he may have tucked away in that hull of his. What I would like to know, though, is how? How did they winkle us out of Pauli-space? According to my book that is just plain impossible, and yet here we are. And there he is, whoever he is."

"See if we can find out." Lowry pressed the stud again. "All right," he said evenly. "So now we know you have muscles. What do you want us to do? Who are you, anyway?"

Both men braced for another thrust of the pressor-beam, but instead the radio sizzled loudly. Sixx had an irrelevant moment of wonder as he recognized the noise. Khandalar! It was part of the oddness of it all that a culture that could play strange tricks with magnetism had yet to develop a reasonably noise-free radio system. Over that awful crackle came a strongly-accented voice.

"This is Lorian!" The tone, the rich arrogance of it, made it sound like some password of power. "You are my prisoners. If you attempt to resist, I shall cut your ship to slices. Do you understand?"

"We understand." Lowry was still calm, "What do you want us to do? And would you mind telling us just how you managed to knock us out of warp?"

"It was very simple. I have men who are skilled in such matters. Some of them were traveling with your caravan. It is a simple matter, when one knows how, to distort the warp-field for a moment. That was all that was needed. When the warp-master recovers consciousness he will not know what happened, or when, or where. And there will be no one to come to your aid, believe me, for no one knows where you are. Only me. This is Lorian. Do you understand?"

Sixx heard a clatter at his back, and here came Miss Stame, sleepy-eyed, tousle-haired and clutching a brief robe about herself.

"What's happening?" she demanded. "What's going on?"

Sixx rose urgently, took her arm. "You go right back to your cabin, get

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some clothes on, grab Quenta and tuck her up safe. Both of you. We have just been captured by pirates—"

"Huh?" She goggled at him blankly.

"Yes, pirates. We've been captured, and we may feel it necessary to argue a little. Hop it now, back to your cabin. And stay there until one of us tells you to come out. Not before. Got it?"

"All right!" she said, and went away, her face showing utter bafflement, but without argument, for which he was thankful. Back in his seat again he was in time to hear Lorian once more.

"You will take no action. You will not resist. We will put tractors on you. We will take you to our base, where you will be dealt with. Do you understand?"

"We understand. Proceed. Out!" Lowry released the stud, and shook his head in quiet thought. "That's a smart laddie. Used to dealing with thickheads. Notice how he keeps repeating his name, and the 'do you understand' bit?"

"I heard. I'm a lot more impressed by the fact that he has pressors *and* tractors. They have really been doing their homework, over there."

"And they have themselves a base, too. You know, maybe we ought to scream for help."

"Huh?" Sixx stared at his partner, and then frowned, and thought it over a little. "I suppose," he agreed reluctantly. "This is something King-Emperor Lagas ought to be informed about. Let's not rush it, though. Let's see a little of what they've got, first, eh?"

He grabbed quickly at his seat-arms as the ship lurched again, even more violently than the first time, and shivered a time or two before becoming stable.

"That boy has a heavy hand on the levers. Whereabouts are we, anyway?"

"Joe's working on that right now. We were only two hours and eight minutes in warp, which gives us a rough estimate to start from, but this region is none too well charted. It could take some time."

"Which we can use," Sixx decided. "No point in letting friend Lorian have it *all* his own way. Let's gather some data, huh? I'll take the ship, you work on that star-system, see what kind of a planet they've found for themselves and their base. Wonder how big a fleet they have down there?"

They were quietly and busily intent for the better part of half-an-hour, in which time that red flare had grown huge and now blazed somewhere off their screens to the right. In its place grew the three-quarter disk of a planet strewn with cloud masses, through which they could see, fleetingly, the glitter of seas and the rolling green-brown of land masses.

"Pretty wild," Lowry estimated, "and warm. Livable but primitive. 'G' is about seven-tenths E-normal. Daylight temperature averages about

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thirty-five centigrade, pretty hot, call it tropical, but our suits can handle it. I think I can point to their base. I'm getting radio frequencies, but garbled. You?"

"*That is some ship,*" Sixx admitted. "Home grown, I'd say. Plenty of power, but nothing we need lose any sleep over. Hah! Joe's got something."

They studied the readout together. "Twenty light-years away from the K-system. Uncharted. And that means, Roger, that Lorian must have his own warp-ship. Must have. The K-drive couldn't jump him this far in a lifetime. He really does think big, doesn't he? And comprehensively. If he has many more ships like that one, we could be in real trouble!"

VIII

"I don't think he has any more ships, Rex. No fleet." Lowry sounded confident. Sixx shrugged.

"You're a good guesser. Expound, oh wise one."

"You only have to listen to him. This is Lorian. Just him. And he does all the talking. And he was here in person to meet us."

"Cogent. But I'm not sold. He thinks big!"

"He is also smart. He doesn't need any fleet, Rex, not with the power and weapons he has right there. K-ships are neither armed nor armored, you know that. They would be a pushover for him in just that one ship."

"Looks as if you just graduated to the top of the class, all right." Sixx shook his head regretfully. "It's a shame, in a way. A man who can think as far-out as that is just what *the K-culture needs to guide it out of* the rut it's in. Pity he's on the wrong side."

"There'll be others to take his place. Right now it's about time he turned us loose, unless he means to take us all the way down to the surface, and I can't say I fancy that. Besides which, it will really soak up his power reserves . . . hold it . . . here he comes now!"

The radio snarled once more. "This is Lorian. I am now releasing you from traction. You will follow me down, and land. You will not try to do anything else, or you will be destroyed. Do you understand?"

"We understand. Go on down. We will follow." Lowry canceled the transmit, switched to intership. "Elleen? Better couch down and hold on tight. We are going in to land. It could be a bit bumpy. Nothing to worry about but it's easier if you're lying down. All right?"

"I'm all right," her voice came worriedly. "but I don't know about poor Quema. She's real sick now. She's howling. I don't know what to do!"

"If you look in the wall cabinet over your bunk, you'll find a first-aid kit. If it gets too bad give her a sedation-shot. Out!" He snorted loudly. "As if we didn't have enough trouble already!"

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"Hey!" Sixx had a sudden flash of inspiration. "Look! Down there! That's their base, isn't it? On that coastline by the river-mouth?"

"Looks that way," Lowry agreed, watching the pirate ship go sliding down ahead. "What's on your mind?"

"Habit patterns. What would you want to bet that Lorian goes for a splash-down? In the sea?"

"Of course he will!" Lowry stated, scowling to himself, and then grinned suddenly. "Say! That's right, isn't it? And that's not such a big base when you come to look at it. We ought to be able to make quite an impression on it."

"That's about what I had in mind myself."

"Very well, Mr. Sixx, would you take us down, please?"

"Roger, Roger!" Sixx performed a snappy salute and grasped the controls eagerly, settling into partnership with the machine. For this one he would not need Joe's expert, but too considerate, services. This one he would do himself. He caressed his jets, his eyes moving constantly from the alien ship in the screen to the dials on his board. Lorian went down in a stiff curve, as smooth and graceful as a swan, striking a path that would take him close over that base and down into the river-mouth, the kind of soft splash-down K-ships had been performing routinely for a score of centuries. For them it was the only way. Sixx was about to show them another.

He was careful to make it appear as if his trajectory was strictly follow-the-leader, so that only he knew by what small fraction it was off. The wailing scream of ruptured atmosphere came now, the screen picture shimmering in ionic disturbance, but clear enough to show a range of low hills, well-wooded, a shallow gorge between them, and then the slope down to the shore line. A small, shingle-edged river-mouth. A scattered array of timber shacks on either side of that river. Radio masts pointing to the sky. Lorian was well ahead now and just settling down into the blue water.

Sixx had only been tickling his jets so far. Now he leaned on them hard, grunting as savage deceleration shoved him down into his seat. The Clipper bellowed down . . . and down . . . and washed that scatter of shacks with searing blue-and-white flames laced with shock-diamonds. Some of that terrible thunder came back through the hull as the squat ship slowed to a hovering halt, hung on its devastating tail for an undecided moment . . . then lifted . . . and drifted along . . . started to go down again . . . changed its mind once more . . . slid away in another direction . . . and now there was nothing visible in the screen but steam and black, roiling smoke.

"We have about thirty seconds fuel left on that tank," Lowry said. "Better leave us the other one for getting back up, Rex."

"Check. This time does it. There

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can't be a lot left standing by now, anyway. Here we go!"

His proximity sensors helped him to go all the way down now, not quite like a feather, but with no more than a solid thump. And, for a moment, there was echoing silence, until Lowry flipped on the outside pickups. Then there came a bedlam roaring, crackling . . . and some distant howling . . . and Sixx said, "It sounds as if some of them were nippy enough to make a run for it. D'you reckon they'll be mad enough to come back?"

"They might just do that," Lowry speculated, "if we stepped outside for a quick look around, and they saw us."

"We'll debate that." Sixx rose and started swiftly setting up the ship for safety. "Take no chances, that's the watchword, check? And we are safe as long as we stay inside, check?"

"But," Lowry suggested, equally busy with his panel systems, "we should hardly be doing what's right if we went away and left a job half done, check?"

"And as this is Lorian's base, and he is a threat to us, it is up to us to delete that threat as much as possible."

"Of course there is always the outside possibility that he will take off in that ship of his, when he sees what we've done, and come sailing over here with blood in his eye."

"But that is highly unlikely. His thinking patterns are all against it, *and* he will be upset about the damage to his base. He will want to take a close-up look-see, even maybe to help a little. . . ?"

"Which will take him all of half an hour, to disembark and get ashore by boat, with a party."

"By which time we will have put in some very useful finishing-off bits, *and* be handy to study his form."

"That's the proposition before the meeting," Lowry declared. "All in favor will signify in the usual way." He raised his right hand and grinned. Both were jocular, but there was nothing humorous about their decision. A calculated risk was all part of their business. As Horn had made it known to all his staff, "Take no chances, but don't miss any either. The harder you clobber any opposition, the more respect they'll have for you afterwards."

"You're fully recharged, of course?" Sixx hinted, and Lowry snorted.

"Do me a favor. I'd be more likely to forget my head!" To maintain his suit at full charge was part of the drill that every agent could do in his sleep, but would never have to, because its care came before sleep, or anything else. That suit was tailor-made to fit him and no one else, and its efficient function could, and often did, mean the difference between life and death. By habit they both ran through a last-minute check and were just turning away for the exit passage when the intercom bleated. Sixx reached for it.

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"Elleen? Sorry to keep you suspended. We are down and stable. No more bumps. Me and Roger are going out for a quick walk around, just to see what goes. We won't be long. You'll be all right so long as you stay put."

"I'm all right," she said, "I think."

"How's our expectant mother?"

"I wish I knew. I'm afraid she is going to deliver any minute!"

"Hm-m-m!" he frowned at the speaker-grille. "Look, you know how to talk to Joe, by now. He's pretty smart. You get into any trouble, ask him. And name the first one after me, huh?"

He broke the link and paused to chuckle at a thought. That would be a confusion indeed, to call the first one Sixx! Then he slapped his helmet tight, flipped the suit-to-suit radio and hurried along, in time to hear Lowry.

"It would never occur to her that she has the entire reputation of I.S. in her hands, and, if she did know, it would only scare her worse than she is."

"Forget it!" Sixx slapped the hatch switch. "All that matters to me right now is my skin. We want to get these fellers real discouraged, Roger, and they are by no means peasants, like those others we met. So we hit them hard, right away, all right?"

"Check." They moved into the air lock and waited for it. "We ought to work our way towards Lorian, sort of go to meet him. And that's down river . . . so we find the river first. And we won't need the gangway." Lowry canceled that, stepped lightly to the edge, took one fast look, and went out and down in a flying leap, into the swirling smoke. Sixx, closing up, saw him plummet down twenty feet into ashes and sparks, and trot away. Peering into the swirling smoke he caught a fugitive flash of something and fell back fast against the air-lock wall. A wrist-thick beam of intense red light scorched past his visor and warmed the indifferent metal inside.

"Well, well!" he murmured. "So we have laser-rifles too, do we? But we have no more sense than to use them in smoke like this, such a waste of time! What's it like down there?"

"Dusty, but you can see a little, close to the ground. Looks like that's the river, over away to the left."

"Go, man, I'll be right down." He slapped the hatch-close and murmured, "Keep an eye on things, Joe, and don't buy anything over the doorstep mind!" then went out and down as Lowry had done, landing and falling forward on to his cushioning palms, not too heavily. In full G the suit could be just a little cumbersome, but in this reduced drag it was no trouble at all. The smoke was indeed patchy at this level. He saw Lowry go away, weaving and crouching, skirting past the burning shells of shacks. He followed, bearing more to the left, and within twenty yards he could make out the braced metal walls and upspringing girders of what had to be a radio-an-

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tenna of some kind. It was scorched but seemingly intact.

Soon change that! he thought, and groped into an underarm pocket, to bring out two pea-sized pellets from a stock there. Taking careful aim he crushed one in his fingers and threw it, then the other, lobbing them through a window frame that had lost its glaze. He ran on, counting the seconds up to five, and there came two hammering explosions, close together, and then a great crackle and squeal of tortured metal as the antenna leaned, creaked, and fell in a thump of ashes and sparks.

"In case you're bothered," he murmured, "that was I. A couple of detonite pills to take care of the radio installation. What d'you know, here's a couple more shacks I missed! Careless of me!"

He lobbed detonite pills freely and ran on, hearing Lowry come back.

"I think maybe I got that feller with the laser rifle, Rex. Two of 'em, in fact. Just come out of the river, by the look. Little fellers, in a kind of blue tunic, with the Lorian patch. The rifles won't be any good any more. I think I can see the river now."

"How far away?"

"I'd say about a hundred fifty yards direct from the ship. I'll stick a while. There're three-four laddies over the other side think they can maybe burn me. No harm in letting them try."

"You're having all the excitement," Sixx grumbled, "I haven't seen a single one yet. I'm bearing well away to your left. Have fun!"

He galloped on, stirring up clouds of sparks and soot until, quite abruptly, he found himself plowing into a knee-deep stretch of reeds that had somehow escaped his baptism of fire. It was a moment to take stock. There was fiery confusion at his back, and lowering wreaths of smoke. Ahead and down was the river, a good twenty-five yards or so wide. On the far side were more high-leaping flames, more masses of smoke, but no sign of people, that he could see. And there, right in front of him was something much more important. A large and crudely-made raft surged and lifted in the river-ripple alongside a wooden jetty that stood at the far end of a path beaten by many feet over the reeds.

"I think," he announced, "I have just found the spot that Lorian will be making for," and he described it briefly. "Now why don't I just stay here and wait for him to show?"

"Better still, why don't I make my way along to where you are, while you carry on down river and meet him before he gets this far, then we'll have him in a box? It's gone dull around this part, now."

"Dull for you, maybe, but I'll bet Lorian's private army didn't think so while it was happening. How many did you get?"

"Call it ten. There were a few I couldn't be sure of, in the smoke."

"Can't be all that many left. A

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base this size wouldn't hold much more than a couple of hundred. All the same, though"—Sixx cast a keen eye around—"I'll watch out for odd ones. Moving along now." He wheeled left, debating a moment whether to stick to the reeds, which were tall, or get nearer the river and be on shingle, which was noisy, or veer the other way and be in the outskirts of the trees, affording cover to those who might resent his presence. And then the decision had to be suspended a moment as something clamped on his left boot. His right hand was full of needle-gun, so he brushed the reeds carefully aside with his left, crouching to see what it was. Then he chuckled gently.

"You won't get much nourishment out of that, buster," he murmured, reaching to grab the scaly horror that had its jaws on his toe. Its duplicate slid out of the roots and seized his hand with enough biting power to make him open his eyes. And, from close to, he saw that the reeds were aswarm with the things, in all sizes from two inches to twelve. It was one of the twelve-inch brand that gnawed at his glove as he stood up, and when he saw the indentations the needle-teeth were making he whistled softly.

"That's some bite you have there!" he said, tucking the gun under one arm and taking the thing by its neck, which was halfway along its body. The front half was all gape and teeth. He squeezed, but it lashed its tail and showed no inclination to let go. Even when he squeezed harder, then harder, until it wrenched and was still with a broken spine, the jaws still clung, and it took him some time and effort to prize them apart. Others were nuzzling at his toes now, not in play.

"Hey, Roger," he said, "keep an eye out for lizards, yellow-green boys like land-going piranhas. They know how to bite!"

"You don't have to tell me, this place is swarming with them. If you stomp them, the others will eat the bodies right off you. Looks like Lorian had bad luck with his choice of a base, if this is a sample."

"So long as they don't come any bigger!"

He stomped vigorously from one foot to the other, stared a moment at the resulting cannibal turmoil, then decided to angle in towards the trees. Within minutes he was free of the reeds, and the lizards and could go forward with care. This was the edge of the camp, now, and the most likely spot to meet anyone who might have been lucky enough to miss the fire bath. Out cutting wood, maybe, or just foraging. There was enough drifting smoke here to make seeing difficult, and he was critically aware of his own visibility. He was debating with himself whether it was worthwhile breaking out his blackout suit when he caught just a flicker of movement ahead and fell for the shelter of a tree bole. A bush beyond him charred into ruin and he drew a mental line from that past the tree

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where he stood, settled his pistol firmly into his hand, poised, waved his left hand prominently on the far side a moment, then leaped out, aimed and fired, all in one movement. The man over there swung his weapon hurriedly but just didn't make it. Sixx ran forward cautiously, eyes alert for others, but no more showed. And this man was no peasant, but a uniformed youngster, his blue tunic bearing the crescents and dagger blazon. Sixx used a moment to examine the weapon, to try it out, and frown at the result.

"Hey, Roger," he said softly, "I've just knocked off a playmate, all in fancy uniform, with Lorian's trademark on it. And he had a homemade laser-rifle that's a shade clumsy but packs a hell of a punch. Better than ours, if anything. The sooner Lorian is put away the happier I'll be. He's a bit too smart for my peace of mind."

"Check here, too. Them fellers across the river were all of thirty-five yards away from me, but they warmed me up pretty good. Those beamers could be real unpleasant, up close. Anything on the river yet?"

"Only ripples. Give it another five. If Lorian doesn't show by then he won't be coming, and we'd be better off back home."

"Check. We'll let him come and get us. Maybe he has a can opener!"

"That will be the day. Stay by the landing. If he doesn't show in five, I'll call you again."

Sixx dropped the laser rifle, tramped it into ruin, and prowled on. By straining his ears he thought he heard motor noises and veered back riverwards, but if it had been real, it had stopped by the time he saw the reeds again. The river was clear. Just ripples. He shook his head, wondering whether or not he had guessed Lorian all wrong, swung round to continue his way. An invisible hand closed on him, shook him into a blur, rattled the teeth in his head, seemed to melt every bone in his body . . . and, through the shivering nightmare he knew, by the feel, that all his suit-systems had gone completely dead. For ten long seconds he floated in a blur-edged sea of nerve-knotting agony, and then, as suddenly as it had come, it went away again. He almost fell with the relief. Blurrily, he saw several figures closing in. He felt heavy and stiff . . . and helpless . . . with a sudden conviction that his immunity-suit was soon to become his shroud.

IX

Outside noises came dimly to him through the rigid carapace of his helmet, but everything else was gone. Just to breathe seemed an effort. Imagination tried to tell him, already, that his atmosphere was foul. Then a familiar and arrogant voice came, faintly, but clearly.

"Stand! This is Lorian. Stand! Do not move, or I will shake you all to pieces!"

Sixx had no intention of moving.

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He wasn't sure just then, whether he could or not. He was still shivering from the effects of that strange blast and it was partly the stiffness of his suit that held him up. What kind of a weapon was that? He dragged in a breath or two and got enough calm to be able to say:

"Roger. If you read at all, which I doubt, better blow. Get lost, and be quick about it. I have just met Lorian and his bodyguard, and he is loaded, but good. Some kind of beam, probably some trick oscillating magnetic field effect, but it hurts. Just about jarred my teeth loose, and it seems to have canceled my suit, so I doubt if this is any good, but if you hear me, boy, go away. Far away."

There was no reply, not a sound, not even the unnoticed but now sadly missed quiet purr of power-assists and system-supports. Nothing at all. It was, therefore, a safe bet that the magnet-pistol in his hand was dead, too. Scratch his only effective weapon. Lorian gave tongue again, and Sixx could identify him this time. The little one in the middle, thick-set, richly garbed, black hair drawn away from a high brow, black-bar brows and an imperious stare . . . and three armed men flanking him on either side.

"You there! You in the white suit. If you hear me, raise one hand . . . do it very slowly . . . now!"

Sixx applied muscles to his left arm and raised it. *Slowly?* he thought. *Brother, if you only knew!* Reacting now just a little from his total disarmament he began weighing what possibilities he had, and the most obvious thing he could envisage was somehow to get out of this armor.

"Good!" Lorian crowed. "Then you *can* hear me. Move forward. March!"

Sixx tramped forward heavily, more thankful than ever now for the reduced gravity. The effort made him sweat, but it helped to clarify his mind, to get clear of the demoralizing sense of utter helplessness. It wasn't true, anyway, not while he was still standing up. If only he could shed this suit! He made a performance out of swinging his arms and was able to slap the needle-gun safely back into its pouch without being seen. Probabilities. Lorian was fond of the sound of his own voice. He would be hurt badly at the wreckage of his base, but he had "face" to maintain. Here he was, in person, to deal with the malefactor . . . and that would have to be "seen to be done" by his armed guard, to produce the proper effect. And he was a gloater, by his voice, and gloating is a lot more fun when the victim can be seen to squirm a little. So the chances were good that Lorian would want him out from under. And that offered quite a few interesting possibilities.

Sixx tramped steadily on, with the six armed men respectfully alert and keeping stations on him on either side. In a while they broke from the

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tree-cover and on to a slow slope of shingle, with the reeds tall on either side, and there was a bobbing blowup dinghy lolling against the run of the river. At a yap from Lorian, and with imperious gestures, Sixx backed close to a tree and stood, while two of the guard slung their curiously clumsy weapons and came at him, gingerly. Small men, about the five-foot-six Khandalar average, and in the standard blue tunic with blazon, they were obviously in doubt as to how to set about opening up that suit. Sixx stood quite still, watching them, listening to the cross-talk, and using the time to breathe and get a grip on himself. Was Lorian as smart as he thought he was? He was! After a minute or two of futile probings and rappings, and some acid comment, he raised his voice again in the tongue Sixx could be expected to understand.

"You in there. You hear me. You will remove your protective suit . . . now! Or I will shake you again, with my oscillators. Do you understand?"

"I understand." Sixx sighed, even though he couldn't be heard, and levered his arms up to press his hands to his helmet and release the catches. In a moment it was swiveled and tipped back clear. Now, suddenly, he heard noises, many of them, the distant roar and crackle of fire, the slap of the water against the balloon-boat, the dry-stone grating of things down there at ground level . . . probably those lizards . . . and he could breathe fresh warm air. What with the fires to help, that air was quite hot, not doing his sweating any good at all, but it was fresh, even if it was laden with smoke and the acrid stink of burning. He could see better, too. The helmet filters had saved his sight more than once, but that kind of protection had to be paid for by a small loss of quality and color. Lorian, he saw now, was really resplendent, his cloak heavy with color and his fingers thick with jeweled rings. There was a matching glitter in his dark eyes as he edged curiously closer to watch.

Sixx took his time, made a slow and deliberate job of it. Lorian might be smart, but it would take a smarter man than he could ever be to grasp all the subtleties of that suit at one run-through. Freeing himself to the waist, he could now withdraw his arms out of the gloves, and sleeves, and collect, right under all the watchful eyes, two lethal pills, one in each hand. They might be extremely handy, if and when the opportunity offered. Keeping his boots on he stepped cautiously out of the rest of it, laid it aside, and stood, apparently defenseless in his one-piece jersey-knit body-suit and belt. He felt a little cooler, but knew that he looked and was foul with sweat. Deliberately he tried to look a little hangdog.

"That's the strip-act," he mumbled, "as far as I go unless I get a round of applause and some music!"

Lorian dared to come closer now,

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holding his head high and back in order to maintain his down-the-nose sneer

"Your sensible co-operation, your meekness, is a trifle late," he said. "You have caused immense damage, cost me much valuable material and very precious lives. For that, you will pay, but the reckoning will come later, at my decision. For now, you will march. You will lead us to your ship, where you will produce the woman, Elleen Stame. Do not be foolish, and waste time in trying to pretend that she is not with you. My sources of information are good."

"They certainly are!" Sixx was genuinely surprised and a little curious. "You surprise me, just a little. I wouldn't have thought she was your type. Somehow I can't see a man like you jeopardizing an entire revolution, risking the chance of winning the throne over the entire Khandalar empire . . . for the sake of an Earth woman!"

Lorian glared, went back a step, and his black-bar brows came down in fury. "For a woman!" he shouted. "You insult me!" and he lunged forward, sweeping the back of his hand savagely across Sixx's face. The glittering rings on that hand didn't soften the blow any. Sixx swallowed some blood along with his rage, and stowed it away for later. "You! Earthman! Do you know who I am?"

"Sure I know," Sixx mumbled. "You are Lorian, third son of Teltor, who is brother to King Rimas of Loges South. Is my information as good as yours?"

"It is too good!" Lorian had swallowed his fury, too, was now grimly intent, his black eyes like daggers. "Where did you learn so much?"

"From the woman. Elleen Stame."

"Aha! Then you are not such a fool as to think that I, Lorian, of the Royal blood, would desire such a female as that, for myself! By the stars, she is even more fat, more grossly flabby, than a peasant woman, and Khand knows they are gross enough." His disgust was patently genuine.

"Then what *do* you want her for?" Sixx demanded, honestly baffled. Lorian scowled at him, shook his head.

"Incredible! It seems you must be a fool, after all. You do not know? That woman is a brain. A memory. A storehouse of information. About us. She is a spy!"

"A what?" Sixx gaped. "A spy? For whom? How? You're not serious?"

"I have information, and a brain, too." Lorian growled. "This much I learned from your Earth culture, among other things. Knowledge is power. I have knowledge, therefore I have power. Soon I will have more. But that woman . . . I have had her investigated. She had no scientific qualifications, yet she was working with a team of your scientists, on Loges. With people who were busily studying and snooping as hard as they could go, probing into all our ways, to find out all they could about

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our people, their ways of life, their habits, their beliefs . . . even the very foods that they ate! So . . ." he made a chopping gesture, ". . . that was stopped! And then what do I hear? That woman has been saved, rescued, transferred to the Royal Palace at Casta, pretending to minister to the Royal sorkis! So I have her investigated, thoroughly. And what do I find? She is a memory, a mnemonic. I know what that word means. It means that she knows much, far too much!"

"You are so right . . . and yet so wrong!"

"Be silent! There is more. The next thing I learn is that she is to be smuggled away to Earth on a pretext! That my distant uncle, Lagas, has arranged a special escort for her, a Security guard. For her . . . and the sorki! Back to Earth. And it is a matter of common knowledge, a disgrace, that Lagas is hand-in-glove with Earth authorities to bring in change, to change the ancient and sacred ways of Khandalar, and to bring in new ways. Which we do not want. And which I, Lorian, will stop, that I promise you. So, Earthman, do you still want to pretend that she is not a spy?"

"Between us," Sixx shook his head, "and don't quote me . . . I'm damned if I know anything for sure any more."

"It is of no importance anyway, what you believe. You will march, as I have said. We will get the woman. I will show you just how much such a person means to one of the Royal blood. I will show you just how quickly a head full of dangerous knowledge can be emptied!"

He stepped back, and Sixx had to think very quickly indeed. Whether or not Lorian was right about Miss Stame . . . and he could well be right . . . her future was likely to be brief in his hands. Sixx's own future wasn't all that rosy, either. On the good side, however, there had been no further recruiting from the devastated base. He had to cope with only the six oscillator-armed men . . . and Lorian. What he needed, badly, was some kind of distraction, some way of averting those hard-eyed men with their nervous trigger-fingers, just as long as it would take him to toss his two pellets. He had enough capacity in either hand to make mincemeat out of the lot of them. Squeeze and throw and count five seconds . . . and that's all, brother! But those beady eyes didn't look like wavering at all. He offered a desperate gambit, grinning at Lorian.

"You really believe that stuff, don't you? About the Royal blood?"

The little man's head came up instantly. "That is something I would not expect a commoner like you to understand. You . . . Earth people . . . you had your Royal bloodlines, once, but you polluted them, thinned them out. Democracy! A leveling down!"

"Hold on a bit!" Sixx protested. "Not so fast with the commoner bit.

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If you took a look at my I.D. tag, you'd see the name Rex Sixx. It's a swell name. I like it. I chose it. But it's not the whole thing."

"So?"

"So my real name is Rex Fairfield Villiers the Sixth, and there is a lot more than just a trace of royal blood bubbling about in my veins right at this moment. For what it happens to be worth. In fact it doesn't mean a thing. I found that out a long time ago. Who your Daddy was, or even your great grandfather, it doesn't mean a thing! What counts is what you have here, right behind your eyeballs!" He used his monologue as an excuse to gesture, and was disheartened by the way those potent muzzles followed his every move. Lorian stepped further back, put on a sneer.

"You are wasting time! Stalling, isn't that what you call it? I've heard of the Fairfield Villiers family. Merchant bankers, very rich. Royal? I think not. Nor do you look like one of them. But I know of a test. When I have the woman I will feed both of you to the zillik, and compare the blood!" Lorian made a sharp, neighing laugh at his own wit, and then a gesture and a barked command to the guard on his immediate right.

And Sixx's world blurred into a vibrating shimmer of agony that lasted only seconds but left him limp, sweating and straining for breath. "That," Lorian snapped, "should remind you that when I say march I mean march! Forthwith!"

Sixx shook his head, not in negation but a vain attempt to settle the whirlpool in it. His gambit had failed. He took a deep breath, tasted the salt on his lip . . . saw that the man who had oscillated him was sweating almost as freely as he was . . . tension was at cracking point . . . there was no hope left . . . he started to turn . . . and he heard, distantly, the most peculiar sound he had ever imagined . . . a kind of shrill tweedling sound. Lorian heard it, too, as did the armed guard. And it was just as obviously strange to them. It came again, louder and nearer, and it wasn't one sound, but many—a weird chorus. It seemed to come from the reeds to Sixx's right. There was a long breathless moment of stilled bewilderment, then several things happened in swift succession.

The three guards who were backed on to the approaching cacophony swung round in unison and anxiety . . . peering . . . and then they slumped and fell in fast succession. Sixx added it up like lightning. How . . . he didn't know or care . . . but Roger was out there somewhere. That was enough. With a squeeze and a quick flick of each wrist he got rid of the two detonite pills, lobbing them away and in front, over Lorian's head and down the slope to blow-up the dinghy. The shrill tweedling was a riot now. Lorian, chin on shoulder, swung to stare at his fallen men and then at the enigmatic reeds. Under the tweed-

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ling there grew a mighty clamor of scrabbling and scraping. The reeds tossed in violent agitation. The two detonite pills let go in a deafening *Blam-blam*, spraying shingle and chunks of dinghy high in the air. Lorian spun farther around.

Sixx tramped forward hungrily, chopped him hard to left and right of that thick neck, grabbed him, hugged him close and whirled him as a shield against the remaining three guards . . . only to see them droop, and fold, and fall limply. He hauled Lorian's stunned weight all the way around again, wondering what was coming out of those reeds. And then he saw. The first sight was a struggling, scrambling, crazy horde of the hard-biting lizards . . . the zillik, he assumed . . . stumpy legs churning the shingle frantically to get away from something to make Sixx wonder whether or not the oscillator had unhinged his mind. It . . . they . . . were sorki-shaped, but streamlined, and the vest-pocket size, all shimmering silver-blue, their sailplane ears enormously out of proportion but immensely useful as they scurried, hopped, ran, swooped in the air, and avidly gnashed their needle-teeth at the soft neck and jaw flaps of the slow-by-comparison lizards. They were ruthless, diving in from all directions, biting and leaping away again, ripping off fragments of leathery scales and coming back for more, their bulging pop eyes agleam with intent . . . and tweedling crazily all the time.

Sixx goggled, held on tight to Lorian, and cringed as the wave of hunted lizards swept past his feet and on down the slope to the water, hotly pursued by the lively cloud of micro-sorkis. And now here came Lowry, large and lithe, looking indecently calm and startlingly primitive in nothing but a brief pair of shorts and his boots, a needle-gun in each large hand. As always he came straight to the important point, nodding to the wreck of the dinghy.

"You made that bang?"

"Check!" Sixx grinned. "And this is Lorian, himself in person. He's starting to come round. But what the blue coronas are those things? And how did they get out of the ship, if that's what they are?"

"Later!" Lowry spun round alertly, and here now came Miss Stame, sheeny with sweat, hair in her beautiful eyes, charcoal stains all over her shins and feet, and the rest of her barely covered in a scanty play-suit. Lowry aimed an arm down the slope to guide her searching eyes.

"Call 'em back, Elleen, and let's beat it back to the ship before any of these sleepy ones wake up. You fit to travel, Rex?"

"I am now. I've seen everything—plus!"

"Right. I'll take him, you bring your suit. Let's move. C'mon!"

There was just time to grab one of the all-important oscillator guns, but no time to talk. He saw Elleen stick a finger in her mouth, heard the shrill whistle. saw the long-eared pack

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swoop up like a fantastic cloud and come scudding, and then he ran. He made good time, aided as he was by the lesser gravitation, but the tweedling little long-eared ones left him standing. Their lean bodies seemed to skim over tiny legs that vanished in a blur of speed, and every so often, seemingly from sheer high spirits, they left the ground altogether and glided, to swoop along and hit the ground again on the run. And there were only six of them, not hundreds, as he had at first amazement assumed. They met no hindrance anywhere on the way except smoke and occasional sparks. Back on the Clipper . . . and Sixx felt sure he would never more forget the sight of those six long-eared shrimps scuttling up the gangway . . . he dumped his out-of-action suit in the passage by Lowry's, beat at the dust and ashes on his arms and legs, and then demanded,

"Will somebody please tell me what goes on here . . . before I snap something vital inside, like my last tenuous link with sanity?"

X

Lowry ignored him for a moment, looked to Miss Stame, who stood amid a tweedling swam of little creatures. "Better take the bunch on in to the lounge and feed 'em," he advised her. "They've earned it. Check up on Quema, too. We'll be up in control, getting set to take off, so don't linger about." He hunched Lorian from his shoulder to greater security under the same arm, and turned to grin at Sixx.

"Bring the suits up, Rex, and you can check yours out while we talk. Oh, and grab some wire so we can tie this up, save him getting into more trouble. He's in enough already. C'mon!"

Five minutes later Lorian was helpless and blindfolded, squatting on the hard deck between the two panels while skilled hands dismantled the security circuits that had been set up and readied the ship for lift. Sixx repeated his request. "Talk, damn it!" he complained. "I can do this in my sleep. Talk!"

"Not a lot to tell," Lowry disclaimed. "The last time I heard from you I was staked out by the landing stage and set to head back to the ship if the big man didn't show, remember? Check . . . so the next thing I hear is an almighty screech from my radio that bent my eardums. Just for a second. Then nothing. I tried to raise you. Nothing. Not even a hum. So it figured that somebody must have hit you with something that had canceled your suit-radio. At least. And possibly a whole lot more besides. And we already know that the K-people are smart with magnetics, even if they can't build a decent radio, so maybe it was something like that." Lowry was steadily and methodically shifting switches and watching flux-levels as he spoke, and Sixx grinned, wondering if His Highness was making anything out of this. It

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was always a treat to hear Roger explaining things in that slow drawl as if they were the most obvious conclusions in the world.

"So what did you decide to do?"

"I didn't figure all that out in one hit, mind," Lowry cautioned. "As soon as I heard that screech I started running back for the ship, and let the figuring catch up by itself. Time I got there I pretty well knew what I wanted to do. First was to ditch the suit . . . if somebody could cancel it that fast it would only get in the way, but there was no sense in leaving it lying about. Anyway, I got back in, started stripping, when in she came, spouting and squawking, having something pretty close to hysterics. I managed to slow her down a little until I could make head and tail of it. Seems that with all the shakes and bumps, Quema must've

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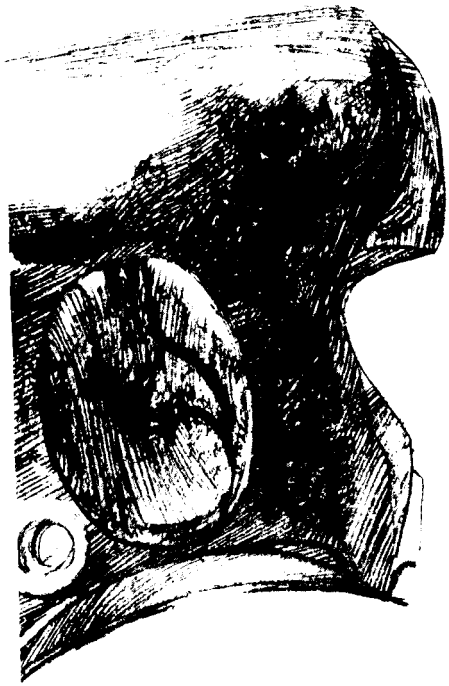

whelped just when we were on our way out. That part is clear enough, but the rest is a trifle hazy. You saw the brood. Six of them. And they were hopping around, all over the show. She has no idea whether or not that's normal. Nor me. It could've been the crossbreeding, or maybe even the warp effect. You know yourself they won't let expectant mothers take a warp-trip.

"Anyway, I didn't have a lot of time to argue. Quema was O.K. and still under sedation, no problem there. But the weenies seemed to have imprinted or something, on her. As Mama. Now . . . when she saw the delivery was imminent . . . and started looking around for protective gear, she found we don't have anything like masks and rubber aprons aboard. Joe told her that. So, being desperate . . . and smart, too, when you think of it . . . she undressed herself and got into a paper throwaway play-suit. And, of course, the weenies fixated on that image and were following her around. And if I had gone off out again and left her she would have gone out of her mind! For sure!"

"Light begins to dawn." Sixx admitted. "So you said to her the way you are always saying to me . . . 'C'mon' . . . and she came, just as she was. And you, the pair of you, almost in the buff? Are you out of your mind?"

"That's all right. I checked with Joe. He had been running tests on the side. Nothing dangerous around. Strikes me that nothing else can get a chance, the way those damn lizards are everywhere. So that was all right. And I knew there wasn't a lot of opposition around, except what you had run into. And I figured some-

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thing else, too. Even if we lost the pups it wouldn't matter any, Quema's the important one, and she was O.K. So I said to her, all right, c'mon, stay close by me and don't do anything stupid. And the swarm followed right on her heels. You saw what happened. Bassorkis are hunting animals. That bunch aren't hardly big enough yet to give anything a fatal bite, but you have to admit they scared the grease out of the lizards!"

"And me!" Sixx added. "But good. However, they did distract Lorian long enough for me to grab him, and that's more than I was able to do on my own. He's a hard man, believe me. He was all set to use me to pry Elleen out of the ship and then cross both of us off. You won't believe it, but in his book she is a spy and dangerous. And those oscillators of his made it easy. They are really something. That's why I gathered one intact. That goes into store, for Horn's experts to play with . . . and devise a shield against. So . . . and now what do we do?"

Lowry caressed his board. "First thing, I reckon, is get off the deck, and soon. Lorian's not such a fool as to leave that ship of his empty. There will be men aboard, maybe enough men to take her up. And that's what they will do just as soon as they suspect something's gone bust."

"Check. Run her up." Sixx hit the intercom. "Elleen? Hold on to your britches, we're off again. Lift in ten seconds, right?"

There was no reply, and in the next breath he saw why. Here she came up through the hatch, swiping at her disarranged hair and puffing. Somehow she managed to look just as divine as ever, even though the charcoal smears had spread from her legs to her arms and face.

"Mind the body!" he warned, indicating Lorian on the floor. "You had better lie flat, noble sir, the next few minutes could be rough. Our propulsion methods aren't quite as sophisticated as yours, in this department." Elleen dropped into the spare seat, Sixx touched the controls, and the Clipper went up, straight up, in a great cloud of soot and ashes. But only until they could get a clear screen picture. Then he restrained the thrust and peered as Lowry spun the camera-eye.

"There he is, Rex, still sitting in the water. Waiting. Shame to disappoint him, huh?"

"Check. And he might take it into his head to follow us, and cause a certain amount of trouble. So . . ." Sixx tickled his controls tenderly and the Clipper tilted fractionally and slid along, climbed at an angle, appeared to hesitate, so that an uncritical observer might have supposed the ship was in some difficulty. Lorian's keep-crew didn't take long to overcome that error of judgment. As Sixx righted the stagger and sent the Clipper spouting down, aiming at that ship down there, there came a winking glow, and he grunted as the pressor-beam struck. But only for the

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split-second it took him to activate the echofield. He grinned at the screen

"Want to try something else, friends?" he invited, knowing that *that* particular pressor-generator would never work again. And that echo-field would also catch the reverse effect of the tractor-beam and bounce *that* back, too, . . . to the ruinous detriment of the beam-generator. Not for the first time, he had his regrets that the Clipper mounted no offensive weapons of any kind as such. That was I.S. policy. The Clipper ships were designed to be as immune to offense and attack as wit and technology could make them. Had they mounted weapons as well Space Navy would have felt very unhappy about the result. So, no weapons. Not as such. But there were ways.

Sliding down on a spouting column of fire, Sixx settled the Clipper with extra careful precision no more than twenty feet above the spire of that ship, and stayed there, blasting it, for a full minute. Then he leaned on the studs and they went up and away, not too fast. In the rearview screen that ship, dwindling away fast, had a glow about it, and a curiously smooth slickness of outline, as if all the protuberances had been rasped off.

"He won't be any more trouble to anybody," Lowry judged. "So now what?"

"Well," Sixx shook his head in thought, "I suppose we had better set ourselves in orbit and scream for help, as we should've done long ago."

"Only we didn't. Because it would take forever and a week for anybody to find us. On the other hand you'll recall that train of reasoning you had, that Lorian has to have his own warp-ship?"

"I remember it well." Sixx nodded. "So . . . ?"

"So where else would it be, except here? In orbit?"

"It's a thought. So all right, we strike orbit and set Joe to look out a warper. Which he can do very well, having been trained for it. And then what do we do?"

"You'll think of something," Lowry assumed cheerfully. "You always do. You all right, Elleen? You look sort of beat!"

"I feel all hollow. Empty. As if my stomach had fallen out."

"Me, too," Sixx echoed, "and who's surprised? How long is it since we last ate?"

"Seems like forever, to me."

"Right, let's go take care of it and see how your brood is getting along." He rose and helped her up and over the flat-out helplessness of Lorian. "I'll make it platters for four, but somebody's going to have to feed him. He's a lot too smart to be let loose."

Somewhat to his surprise the midget beasts were none the worse for the shake-up they had had, and were frisking about and plaguing their mother. Quema managed to

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look self-satisfied with herself as she lay in her quilted basket, and he could have sworn that she was amused when her lively brood deserted her as one to cluster around Miss Stame as soon as she appeared.

"Oh, no!" she groaned, and he chuckled.

"You need a technique for affection-transference. If I may suggest . . . you feed the old lady on a kind of granulated meal, don't you? Will they eat it?"

"Will they?" she shrilled. "They've had a heaped bowlful each already, not ten minutes ago!"

"Fine. Listen, this may be messy, but try it. Sprinkle Quema with the stuff. Plenty of it. Let them find it. Let them learn to associate her with food, and you have it made!"

"That's marvelous!" she glowed. "Why can't I think of things like that?" and she ran to her stores at once. He watched her a moment, noticing that she had plundered the autochef for foil bowls, and shook his head at his own thoughts. A man could get used to her being dim, he supposed. She was harmless. She was able to follow simple instructions. And she was enormously decorative. If only it wasn't for that awful voice! He set up the cook-program for four steak-eggs-and-mush and thought of a way to occupy the waiting time. He returned to control and collected his suit and the oscillator gun. Lowry gave him a glance.

"We're going to be tight fo. rocket-fuel, Rex. We'll have enough to make orbit and then a little, but nothing to waste."

"Then we either have to find that warper, or be stuck here until we are found by somebody else. And I don't fancy that much. I'll be in touch."

In the workshop, on the deck below the control room, he linked Joe in with his probes and gave his suit a fast check-out. Much to his relief once he had replaced the power cells the systems showed only a fractional reading below par. The oscillator gun was something else again, and he puzzled over it for a while without being very much wiser. The circuitry in that gadget was away out of his competence altogether. Hoping it wouldn't be equally beyond Horn's tame experts he returned to the lounge in time to hear the auto-chef ping out its signal of readiness. Also to feel weight beginning to dwindle fast, a sign that they were almost in orbit. It didn't seem to bother the little tweedlers at all. They apparently took it in their stride . . . or flight . . . as they chose. It was something to see them leap and take off, and swoop about and land, their tiny legs going in a blur of speed. Even Miss Stame had to laugh.

"They're kind of cute!" she cried. "And they don't bother me much, not now. And it's all thanks to you!" She looked as if she might want to demonstrate her gratitude in some tangible way, and he backed off.

"Hold it, now," he said. "All part of the job. Besides, I have to get

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cleaned up, and fast, before the dinners get cold. You'll excuse me." He hid in the shower cubicle hurriedly and his subconscious began to work. He had not planned it that way. It just happened, as it always did when something came up to distract him from his main problems. By the time he was dry and into a fresh body-suit she was emerging from the other shower, this time in a very brief paper-tunic that did even more for her than the play-suit had done. But he thrust that kind of thought away firmly.

"Come and help carry," he instructed. "I'm going to need you. I hope!" Back in the control room again Lorian was sitting up, the blindfold removed, and Lowry dabbing, none too gently, at his nose-bleed.

"I thought you said he was a hard man, Rex? A little dose of G and he bleeds just like anybody else!"

The Khandalar prince didn't look nearly so regally sure of himself now. "What are you going to do with me?" he demanded. Sixx settled a platter on his lap carefully.

"First off I am going to untie your hands so you can use them to feed yourself. If you don't want to, that's your loss. If you try to do anything else with them, I'll kick your teeth in. Right?"

He found his own seat, speared a mouthful, chewed on it, and went on. "In the meantime it's about time you got yourself told a thing or two. You are still Lorian, nothing can change that, but you now have no base. It is scratched, written off, deleted. We did that. Your men . . . and your communications—all gone. Also your ship. We dealt with that on the way up. Written off. It is my guess that you are the mainspring of your revolutionary movement, and that without you it will run down. So much for that. But that doesn't really concern us. None of our business. Our job is to get safely back to our base, back to Earth, with the Royal sorki. And that is what we're going to do. That is the next item on the agenda."

"Bah! You persist in that stupid story?" Lorian growled, choked on a bite and purpled before he could regain his voice. "Do you deny, still, that *she* is your prize? That woman . . . your spy?"

"Who, me?" Miss Stame squawked. "Me? A spy? For what? Is there a war on, or something?"

"Or something." Sixx chuckled, more at the look on Lorian's face than anything else. He had almost grown used to her unmusical yap, had almost forgotten his shock at first hearing it. He grinned at Lorian. "Still think she is a spy? Well, if that doesn't shake you loose nothing will. Not that it's important, one way or the other. We are taking her along with the sorki, so that's that. The immediate point now is that we think you have a warp-ship here somewhere. And we need it. We want it to shunt us back to Earth. And that is where you come in."

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Lorian stared in open astonishment. "You expect me to *help* you?"

"You will. As I said just now, you are still Lorian, and that's a name to conjure with. It carries power. But you are our prisoner. We hold you as a hostage. Get me?"

Lorian snorted, licked his fingers daintily, and snorted again. "Never!" he said emphatically. "I help *you?"* and he made that harsh neighing laugh again. "You forget, I know Earth ways, the soft sensibilities of humans. If the positions were reversed . . . but they are not. You cannot compel me to do anything. I defy you."

"You're going to be surprised at what I can do." Sixx promised, and meant it. Lorian neighed again, then frowned.

"Mr. Sixx, you are a competent person. An efficient and resourceful person, you and your large companion. I could use men like you. And the rewards would be great, greater than anything you can imagine. You know only a small fraction of the Khandalar culture. There is much more. With me as supreme ruler, and your patron . . . I could make it really worth your while, you know!"

"Save it. Don't waste your breath on it. You fancy something to drink? We don't have anything vintage, only coffee, or orange juice, maybe?"

"Coffee will be quite acceptable, I thank you."

"I'll go get it, and we'll talk some more."

When he got back, carrying four hot cartons, Lowry was leaning back in his seat, his foot up on the panel, his bland face placidly regarding the deckhead, while Lorian was stretched out flat on the floor, bleeding again from the nose, but not, by the look, as the result of acceleration forces. Miss Stame's beautiful eyes were stare-wide, as was her mouth as she started to splutter an explanation. Sixx hushed her with a palm.

"You don't have to tell me, I can guess." He watched Lorian struggle upright, estimated the force it had taken to squash his nose out of shape that way, and sighed. "You aren't the first, mister, to underestimate Roger. That half-asleep look of his is a con . . . as you know. Here, swallow some of this and try to shake loose from a few of those high-minded notions of yours. You can't buy us. At all. But we can help you. A lot. Think . . . for instance . . . what King-Emperor Lagas will do to you when we turn you over to him with a full, blow-by-blow record of what you've been up to. You say we humans are soft, and you may have yourself a point. But Lagas isn't, he's one of your kind. And by him you are a traitor. Think about it!"

A twitter from the computer drew his head round. Lowry came down and alert peering at his meters. "That's it, Rex. We guessed the right card. That is a warper, no doubt about it."

"Check. Let's close in on him very gently, Roger. If we can see him, it's

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safe to assume he can see us, so let's not get too close."

Lorian snorted. "You are stuck, Mr. Sixx, unless you have weapons to overpower that ship . . . and I deduce, from your wheedling, that you have not."

"You deduce right, mister, and you don't have to tell me not to go too close. A smart man with a Pauli-field could turn us inside out, literally, or extinguish us like a candle, or several other, equally nasty things, if we got too close. But you are with us, Lorian. If we go, you go. Think of that!"

Lorian stared at him steadily. "Do you think I am afraid to die, you fool? I am of the Royal blood, remember? Death does not frighten me. Do what you will . . . or what you can, Mr. Sixx. You're stuck, and you know it!"

XI

The warp-ship was almost a visible disk in the viewscreen now, one dot of light among so many. Sixx's eyes flickered between it and the distance-reading on the proximeter. Both he and Lowry knew full well the dreadful things that could be done with a deformed Pauli-field in the hands of a skilled . . . or insane warp-master. It had happened a time or two. That unique power could get to a man and warp his reason as severely as the field could warp space. There was no need for his breathed advice:

"Let's go nice and steady, Roger. Not too close. We know his limits. All right, Prince Lorian, you have a point. By no means can we take that ship, not by force, not if he . . . whoever you have on there . . . doesn't want us to. I know it, you know it, and he knows it. But I am not stuck, not yet. Just now I asked you to think what we can do *for* you. You're a smart man. You'd never have reached this far otherwise. And there's always room for a man with brains. On Earth. Take that magnetic oscillator effect of yours, for instance."

As if on some dire cue, he had hardly spoken when he felt his bones buzz, and his eyes blur, and thin agony scoured every single separate nerve in him, as the control-room lights dimmed, darkened down to a dull red . . . and the whole ship sang like a gigantic violin string. Fighting to make his voice come through his tortured throat he croaked,

"Don't! Roger . . . don't . . . switch . . . to . . . battery . . . don't . . . *switch*!"

His own voice had a steel-wool rattle in his own ears as he strained against that deadly vibration, trying hard to cringe himself together . . . not to dissolve apart . . . and then, like a snapped wire, the torture was gone, and he slumped, heaving in great tortured breaths, blinking away the sudden sweat from his eyes. The lights were still dying-ember red, the panel gauges shivering hysterically.

"We got to use the batteries, Rex!"

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Lowry spoke through his teeth, his whole body shaking. "We're just about dead right now."

"It's O.K. to switch now, and back off, fast, before he belts us one more." His arms cramped like an old man's, he fought the controls, and the Clipper came grudgingly to life, rapidly increased her distance from that spot over there. "When I checked . . . my suit," he muttered, "the batteries, all the powercells . . . were flat. But the systems . . . were all right. We'll be all right . . . in a minute. Hoo, boy . . . we can't take any chances with more of that."

"How do you know he doesn't have unlimited range?"

"I don't. I'm guessing. Look, unless they have somehow suspended all the laws I learned at school, there is no shield for magnetism. None!"

Lowry nodded, flipping away a bead of sweat. "That's the way I remember it, too, Rex. But . . . hell . . . what about the operator? What about the guy who holds one of them scramble-guns, and fires it?"

"That's why I'm guessing. I *saw* the last man who poured one on me . . . and he was sweating damn near as badly as you are now. So I guess the most they can do is shape and direct a magnetic field, somehow . . . that's bad enough . . . but there is bound to be a bleed-off . . . or a halo effect. And even if it is only a fraction, it's enough to discourage the man using it . . . unless he *has* to. Figure?"

"Hope you're right. On that basis they won't dare whomp up their power too much, or they knock themselves out. How about that, Lorian?"

The Royal person was in very bad shape now. The oscillating nightmare had restarted his nosebleed and his richly embroidered robe would never be the same again. He was pale and shaken, but still arrogantly determined.

"You have guessed with reasonable accuracy, Mr. Sixx. For what good the information will do you, yes, there is an unfortunate halo effect from the oscillator, of the order of one tenth of one percent of the field intensity. It is a minor defect."

"In your opinion, sure. You don't have to fire the thing. I wonder if your loyal followers feel as casual about it. But you wouldn't know, or care." Sixx swiveled in his seat as Miss Stame let out a low croak and stirred into life. She sat up and shook her head, and groaned again.

"What happened?" she demanded.

"You have just been exposed to a fancy weapon invented by our Royal hostage here. Mounted on the warpship. They won't do it again. To hurt us at this range would hurt them more. Just the same, though, we'd better try reverting to generators. Roger?"

"Can't hurt to try. They've had a little while to warm up again." The reversion took ten careful minutes, in which time Miss Stame had

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groaned a lot but without verbal complaint, had even found the heart to toss Lorian a tissue. Sixx noted that, and bore it in mind. She was tough, in her way, under that eye-catching epidermis. *All what other things?* Her indignant query came back to echo in his mind, and he grinned wryly at the thought. There weren't so many of those other things, after all. Only that lamentable voice. But then he let the thought go and came back to more urgent matters.

"It's about time we laid a few things on the line," he said, putting a determined eye on their prisoner. "So long as your crew aboard that warper stay hostile we are stuck. We *could* warp out on our own unit, which would be rough for me and Roger, and gruesome for you and Eileen . . . possibly fatal for the sorki . . . so that is out, except as a very last resort. Our job is to deliver . . . and that is what we are going to do, or bust. So we need that warper."

"So you are stuck!" Lorian retorted indifferently, dabbing at his nose. "As I have already told you. And do not think you will sneak up on my men by some trick, or catch them asleep. They know better than that."

"You know," Lowry sounded thoughtful, "I hate to say this, but it looks as if maybe he's right. Maybe this is the time to scream for help."

"Later. If we have to. I said, this is the time for laying a few things on the line. Give me that radio board." He adjusted for the frequency favored by Khandalar and switched on.

"Warp-ship! Do you read? Anybody read Anglic? This is *Clipper IV* to warp-ship. Anybody read me?" In a while there came a crackle that made him wince and mumble, "I am not stuck by any culture that can't even build a decent transmitter. Never!"

"This is Captain Polanat, of the warp-ship." The speaker had an atrocious accent but his words were perfectly understandable. "Keep your distance, *Clipper IV*, or you will be detroyed!"

"Not with what you've got, mister. We felt a little tingle just now from your efforts in that line. If that's your best, save it. We won't come any closer, not yet a while, not until we are ready."

"We have other ships, Earthman, and other weapons!"

"Sorry . . . I disagree with that, too. Your other ship has been taken care of, also your base. You are on your own. Think about it. Try making contact with your base, and your ship, if you don't believe me. And stay tuned, there are further surprises on the way. Nasty ones!" He flipped the switch and turned to grin at Lorian. "That clears the air a bit, doesn't it? We can't get close to that warper, true . . . but it is almost helpless on its own, as you well know. And they know. It's a nice situation, almost a stalemate. But not

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quite. Now I am *really* going to work on you."

Lorian snorted disdainfully. "Words!" he said. "Empty words!"

"Not quite. Habits of thinking. You'll see. Keep an eye on him, Roger, just for a minute." Sixx rose and went away, reeling a little as the after-effect of that oscillator-blast lingered in his legs. He swung down to the workshop and was back in moments, making no secret at all of what he carried. It was a small, portable benchvise. Seating himself again he proceeded to clamp it to the edge of his panel, choosing a spot where it wouldn't interfere with the access to controls. Lorian eyed his actions uneasily. Lowry was just as unsure. He stared at Sixx.

"What have you got in mind, Rex? Thumbscrews?"

"Nothing so uncivilized . . . so feudal. I'm human, remember? And being human," he turned a calculating eye on Lorian, "I am naturally sold on the notion that sanity and reason are bound to prevail. So, I'll play you one more game the rational way. Like it is none of my business but I hear things. Like Lagas has it in mind to remodel the Khandalar constitution, to make it more a democracy. He's had an Earth education, like you. He has big ideas, like you."

"He is a fool!" Lorian stated. "Khandalar has stood fast, a three-world united empire, for more tens of centuries than anyone can count. Before you humans came from your trees! And he thinks to change all that? He is not just a fool, he is insane!"

"All right, so he is going to make a mistake or two, so what? Change is on the way. Neither of you can stop that. His idea is to ride with it, but your aim is to try and stop it flat. With more and more of our ships coming in and out of your splashports, more and more of your common people joining up and traveling, seeing how the rest lives, coming home to talk about it . . . you would stop that? Now who is the fool?"

Lorian sneered openly. "We of the Royal blood of Khandalar can stop anything, and *anyone,* Earthman. We have absolute power, something you cannot appreciate or understand. Perhaps it will not fall to me . . . and if that is to be my fate, so be it. But there will be others after me. We will rule!"

"I was just coming to that." Sixx crumpled his empty coffee carton and tossed it aside, settled himself comfortably, his fingers toying with the vise toggle. "I've heard of this absolute power. But suppose it failed? Suppose it was canceled, or withdrawn . . . even stolen . . . what then?"

"I hope you know what you're doing, Rex." Lowry sighed, and Sixx gave a fractional headshake, as Lorian snorted again.

"I refuse to suppose anything so ridiculous."

"Fine! That confirms something I had suspected. I'll come to that in a

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minute. Ridiculous, huh? Can't happen? Well now, I thought the same way about that suit of mine. That's the I.S. special, supposed to be proof against just about anything! Short of heavy battle weapons. You know? And then you bob up with a new toy, and I'm dead, just like that! So I do appreciate just how difficult it is to suppose absolute power is suddenly cancelled. And when it happens . . . if it should happen to you of the Royal blood like it happened to me . . . you're going to have to do the same as I had to do. Forget the gadgets, and use these." He tapped his head meaningfully. "Brains. Wits. You've got some. You've had an education. You *know* there is no such thing as absolute power, period. Sooner or later somebody will bob up with a toy to beat it. So, I ask you again . . . suppose! If and when the Royal power fails, your Royalty is going to be in a corner. If they are going to stay in office at all, it will be by wit and talent, and ability, and brains. You've got plenty. Use them now, don't waste them. The Royals of Khandalar are going to need men like you . . . and you are going to need them, too. You or whoever takes up after you."

"What's all this absolute power you're talking about?" Miss Stame asked wonderingly. "Do you mean the Crown Stones? That's just a lot of superstitious nonsense!"

Bound as he was, Lorian surged violently at her and Sixx shoved him back down with an ungentle hand.

"And you still think she's a spy, after that?" he demanded. "Use your head, can't you? You know you can't win. Not you, nor any smart guy who comes after you. Why not cooperate? All you have to do is talk to that crew on the warper . . ."

"Never!" Lorian blared.

"I know . . . you'd rather die!" Sixx shook his head. "All right, you can't say I didn't try." He turned back to the vise, and Miss Stame touched his arm.

"He won't change his mind, will he?"

"I'm afraid not, not even if I put his fingers in here one at a time and scrunched them!"

"You wouldn't!" she shivered. "I couldn't stand that. I should probably faint or something!"

"Well, don't!" he advised. "I'm going to need you in a minute. He is going to talk, to help us, and I need you to monitor what he says, just to make sure he doesn't pull any fast ones. I'm not all that fluent at K-talk."

"You fool!" Lorian snarled. "You will never persuade me to help you. My honor forbids it!"

Sixx was completely unimpressed. "You know," he mused, "this thing would be simple if you people were smart enough to have workable television on your ships. I could *show* your loyal followers that we actually do have you aboard and we were in the process of cracking your knuckle joints, one at a time, until they got

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smart. But as it is we will have to do it with sound effects and hope that they get the message. For your sake."

Lorian's eyes glittered and there was a slick sheen of sweat on his brow but he was still defiant. Lowry stirred uneasily.

"You said a nice long speech," he murmured, "and I know you well enough, Rex, to know you think you have something still up your sleeve . . . but this time it had better be real good."

"Not up my sleeve, Roger. In my belt. And it's good." He tugged at the stiff fastenings, opened the pouch, put his fingers inside, and shook his head at Lorian. "In a way," he said, "I have to feel a little sorry for you. You've been wrong all the way down the line. It's a shame, but there it is. We did not travel all the way to Casta from Earth to pick up any spy. Nor, really, did we come to collect one very precious, very rare, Royal sorki. What we really came for was to steal away your absolute power. I did try to warn you. I did try to persuade you by reason and common sense, but you wouldn't hear it. So I have to do it the hard way. Absolute power . . . right here in the palm of my hot little hand. Recognize it?"

He held his hand flat, cautiously out of reach but in sight, so that the control-room lights glittered on that rounded cube and broke tiny spears of red fire from the imprisoned gems inside. And now Lorian was really sweating, his eyes bulging as he glared at the bauble.

"It is not true!" he choked. "It cannot be true! That looks like the Crown Stones . . . but they are always on open view—"

"In the Public Cabinet . . . I know. And they are still there, so far as anyone suspects. Only those are fakes, and these are the real things!"

"That is impossible. How could *you* have them?"

"Simplest thing in the world. We had a fake already prepared, and we switched them. Simple. Even a rank amateur could palm a thing this small. It was a walk!"

"Impossible!" Lorian insisted grimly. "No one is allowed to touch the Crown Stones, only those of the Royal blood!"

"That's right. And who do you think worked the switch for us? None other than your enemy and our pal, King-Emperor Lagas. I watched him do it!"

"It's impossible!" Lorian insisted desperately. "These are fakes . . . the others are real. You are trying to trick me!"

"Oh come on, now!" Sixx protested. "I'm smart, but I am not *that* good. How was I to know you were going to capture me? You're not thinking! You say your information is good? Use it. You *know* that Lagas hired I.S. for a job. You *know* that we went all the way to Casta, to the Palace. You *know* that we left again shortly afterwards . . . with one sorki and attendant. A spy? You

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can't still swallow that, surely? A Royal sorki . . . all that fuss? Come on, now, you know it won't fit. And least of all will it fit that we went all the way there, and started out to come back again, with a fake!" Lorian's eyes started to glaze as he stared at the unthinkable. Sixx chuckled.

"Face it. Use your head. These are the Crown Stones of Khandalar, and I have them right here in my hand, Lorian. Think. And while you're at it think of this. I was not fooling, back there, when I spoke of having a tincture of Royal blood in my veins. That was true. So there's no reason at all why I shouldn't pop one of these little beauties out of the shell" he pressed his fingertips to the cuboid and experimented a moment, and out came one pinhead of fire, still secure in its own insulating sheath, to twinkle on his palm—"like that, see? And then all I would need to do is take off the insulation, and hold it in my fingers . . . and then, Lorian, I could *compel* you to cooperate with me. And how about that?"

He had never before seen such utter despair on a man's face. In that moment, with the tiny thing in his fingers and Lorian's total demoralization a stark reality before his eyes, he realized for the first time just a little of what such power could mean. Talking about it was one thing . . . but to see it, to have it in his hand . . . was quite different. Was terrifying. Lorian was as frozenly helpless as a rabbit before a swaying snake. Lowry stirred.

"You're getting a bit far out, Rex."

"You don't have to tell me," Sixx shivered. The tiny thing seemed to burn his fingers. "Acton was absolutely right. This is no kind of power for a man to have. Lorian," he turned a hard eye on the stricken princeling, "we are taking this bauble back to Earth, not because it represents anything particularly precious to us . . . it doesn't. This kind of power would never be tolerated for a minute with us. No . . . but the scientists are curious. They want to play with it, to find out what makes it work. If and when they ever do, you can bet your life *that* secret will go right underground until they also find some way of blocking it. Which they will. We are that kind of people."

He swung back to the vise again and twisted the toggle gently to ease the jaws apart. Then, with his fingertips, he inserted the tiny gem between the steel jaws and started tightening up. "So," he said quietly, "this is what I do. I get this up tight. So!" and the jaws came gently on the little red thing. "Then I switch on the radio and get your man over there . . . and then you talk to him. You tell him that we want a fast and smooth passage back to Earth . . . and no tricks. Elleen will listen. And you just utter one doubtful word, try just one fast move of any kind . . . and . . . crunch! You understand?"

"You would not!" Lorian croaked.

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"They are precious . . . sacred . . . unique . . . irreplaceable! You would not!"

"You just try me, that's all. Here's the mike. I'm switching on now. Remember . . . just one wrong word! Elleen, you listen real close!"

XII

"It was one of the smoothest and quietest twenty-four hour jumps Sixx had known. The all-important gem sat snug between the jaws of the vise all the way, with either himself or Lowry constantly in attendance on it, just in case. But Lorian gave them no trouble at all. He endured the trip securely bound hand and foot in one corner of the lounge, with the microsorkis using him as a playmate of the passive variety, and had nothing to say at all. For the final moments of warp-out and approach to Armstrong Base, however, they frog-marched him back to where he could see the threatened Crown Stone, as a constant reminder to him to be good. And it stayed there until I.S. men had come and gone, in relays, to take care of the warp-ship and its crew, and its interesting armament. And the hand oscillator—and Lorian himself, with ceremony. And then Miss Stame, to an obscure fate. And then the sorkis, all seven of them. Then, and only then, did Sixx release the all-important gem from its hazard, to return it to the cuboid shell, and to take it with him as he and Lowry went to report to Horn.

"There was a hairy moment or two," he admitted, as the pair of them relaxed a little in Jason Horn's quiet office, "and that is a highly interesting planetary system. Lagas might be interested in it as a handy penal colony. He is certainly going to need something of the kind. Right now it is infested with zilliks, but an influx of hunting bassorkis might be the thing to change all that. There's the ruin of a base, and a ship that won't be going anywhere for a long while. Odd ends to be tied off. And, of course, there're these." He opened up his suit, got out the precious cuboid and laid it on the desk. "Frankly I'm a bit surprised McLaren isn't here champing at the bit to get his hands on this."

"On this?" Jason Horn elevated a white eyebrow. "Or the real one?"

"I guessed that far," Lowry sighed. "I figured even you wouldn't go so far out as to crunch up the real stones. But you took a hell of a gamble, Rex. He could've called your bluff."

"Never in a million years. Roger, you heard Lagas himself admit that he was scared of the things. And you saw Lorian's face. Habits of thinking are pretty hard to change. And that is no kind of power for a man to hold in his hand, believe me!" He wrestled with his boot a moment, then broke open the heel and produced the other cuboid, placed it on the desk discreetly distant from the first one. "That's the real one."

"It's quite a thing," Horn leaned

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back in his chair thoughtfully, "to trust a man with that much power, especially when you have reason to suspect that man is likely to run into a jam and be tempted to use it. You know our watchword 'Take no chances' is a good one. I believe in it." He leaned forward again, scooped up the two cuboids in one palm and juggled them gently. "That's why McLaren isn't here . . . as you say panting. He has had the real Crown Stones for some time, ever since I turned them over to him, right here. These are both fakes. I brought the real ones with me, in my pocket, while everyone was watching you two."

"Now just a minute!" Sixx gave him a bleak eye. "You mean to tell me we went through all that fun and games for nothing? Just a blind?"

"Hold on a minute yourself, Sixx," Horn advised, not loudly but with an edge to his voice. "I run this business. I've been running it for a good many years now, successfully. If there's anything I've learned in all that time, it's how to estimate a man's capacity, his value . . . and to use it fully. I'd claim I know exactly what you two are capable of. I wouldn't use you just as distractions, you ought to know better than that."

"So you say. I think I know my value, too. But I just heard you say we made that trip, and stuck our necks out, for worthless imitations!"

"Symbols, Sixx. Symbols of power. Habits of mind. Abstract values. It took me a lot of hard figuring to realize, in the end, that it didn't really make any difference, one way or the other, whether you two were carrying the real thing or not. I tried to sell that idea to Lagas, when he first called me in for consultation about method. 'Save yourself a big fee,' I advised him. 'I'll get a duplicate made. I'll show you how to work a switch. You slip the real one to me, I'll shove it in my pocket and walk off with it, and nobody will be any the wiser. Nobody would *believe* you would do anything like that!' So I told him. But he couldn't accept that. Hierarchical patterns again, you see? To him the Crown Stones are sacred objects, and ultra-valuable. He could be civilized enough to realize that they are a curse and a weakness; smart enough to reason that he ought to get rid of them. And he is used to subterfuge, and devious ways, so the charade part of it was right in his pattern. That was exactly right. A plot! But the idea that I would just slip them in my pocket . . . a plain, flat, calculated risk, without fuss . . . that he could *not* see. So I had to play along, to stage a kind of show, just to keep him happy."

"Well, all right." Sixx was a trifle mollified. "But you could have told *us*! I mean, we damn near got ourselves killed a time or two. For nothing?"

"Oh, no! Don't get that idea. You two were carrying very valuable goods indeed. Believe me. Some-

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thing a lot more valuable to us than ever the Crown Stones could be."

Sixx frowned at him. "Not the sorkis," he declared. "You are never going to sell me on that notion!"

"I wouldn't try. Although your report on the way they handled those lizards could have considerable economic importance, and it will be dealt with. That information could well add to their value considerably."

"Didn't I say it?" Lowry demanded quietly but intensely. "Didn't I? It's Elleen. She was the apple in the pie all the time!"

"Check!" Sixx retorted. "So you are a good guesser, an intuitive genius! All right! But what? What has she got? I mean, apart from all those other things that every right-minded girl would sell her soul for . . . what?" He aimed the question at Horn, who grinned and leaned back in his chair.

"She, boys, has a memory. She *is* a memory. Like videotape. Anything once seen and/or heard, never forgotten."

"So?" Sixx prodded. "We already knew that much."

"You did?" Horn came forward again in surprised anxiety. "How?"

"She told us herself. Was it a secret? Because Lorian also told us. He knew. He had her tagged for a spy. Hey . . . don't tell me he had it right?"

"No, no! Not a spy, not in his sense of the word anyway."

"Then what?"

"Well," Horn settled back again, appeared to be arranging his mind. "It's not easy. As you probably know I like to keep abreast of the background in any major assignment, so I have done considerable homework on this one. As I say . . . not easy . . . but I can simplify it enough to give you that gist, the broad picture. Old age is the condition, longevity the dream, gerontology is the study. And the scientists have been chewing away at it for more than a century now, without getting very far, or with anything very concrete. They have a few assists. It helps, for instance, if your parents were long-lived. Sensible hygiene, sensible diet, staying slim, avoiding this and that, taking more care . . . these things all help. But to what? Only to make it possible that more and more people can hope to live to be somewhere between seventy and ninety years old. That's the break point. What some biologists are calling 'The Biological Barrier' on an analogy with the sound-barrier in atmospheric flight, or the Einstein limit in space flight, and so-on.

"The trick, you see, is to break it . . . because it can be broken. That is not just biological theory, it is fact. Far too many people manage to live away past that limit for it to be acceptable as just accident. But, paradoxically, not nearly enough for science to be able to scrounge out any hard data. Because, when you come right down to it, this is one of those experimental situations where your

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test material lives as long as the people running the test . . . sometimes longer . . . which makes it difficult.

So when it became known and established that (a) the K-people are as human as we are in everything that matters, (b) the common people have exactly the same life span expectancy that we do, in comparable circumstances, but (c) the Royalty routinely expect to live at least one hundred fifty years, often a lot longer, and (d) that the K-way of life hasn't altered substantially since who knows when, but is now starting to change fast . . . then you realize why Sir Bernard Monkton was prevailed on and financed, to head a gathering of experts, a hand-picked team, to go ahead and investigate the whole thing. Now, Sir Bernard was notoriously a man very slow to commit himself on anything, not given to quick claims, or rash generalizations. So when he made it obvious from one or two hints that he thought he had all the data necessary . . . not the secret itself, but enough data to be able to work it out . . . that was good enough. So he had the data . . . but all his records were destroyed . . . and that data, now, is all in Miss Stame's pretty head . . . and nowhere else! And I shouldn't have to tell you that it is critical stuff. Explosive. All right? You brought home a prize! Very satisfactory indeed!"

Such praise from Jason Horn was rare. Sixx chuckled. "That sounds

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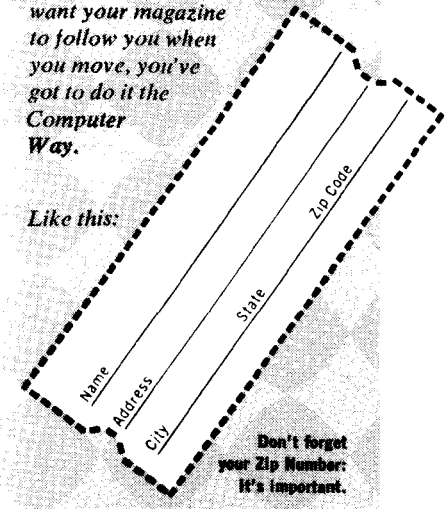

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like this is a good time to hit you for a month's leave and a bonus."

"You've got it," Horn said, without hesitation. "You've earned it!"

"Thank you very much," Lowry murmured, looking thoughtful. "This sort of changes things a bit, Rex, huh?"

"A little. So she's highly valuable, huh?" Sixx stared at his employer with an innocent expression that modulated slowly into a grin. "You know, sir, those experts who are standing by ready to pick her brains . . . they are going to earn everything they get, too. She is not exactly the brightest person in the world, not unless you know how. Incidentally, what's going to happen to her?"

"I'm making final the arrangements right now. She is to be guard-escorted to Earth, to wind up in Princeton. The team of experts are gathering already. Nothing for you to worry about now. You've done yours."

"I don't know so much," Sixx mused, swapping glances with Lowry. "It doesn't seem right, somehow, that we should drop out before the job is done. I reckon we ought to stay with her all the rest of the way."

Horn was really surprised now. "You mean you two want to volunteer to escort Miss Stame the rest of the way?" His brows came down like a white hedge, and he squinted from under them at the bland-faced pair on the other side of his desk. "I'd say she's a very pretty girl . . . but not *that* pretty. And there are other things. Besides, from here on it's a breeze! No hazard. Just a formality."

"So what's wrong with that?" Sixx was indignant. "Why can't we have an easy one, just once?"

"Yes," Horn drawled. "Yes. Volunteering, huh? I'd give something to know what you two are up to. Still"—he shrugged—"I had you scheduled for leave anyway. I don't see how it can hurt." He touched a button in his chair arm and spoke to his wrist. "Harriet? Have Miss Stame come up to my office right away, please. And delete Woodstock and Kohler, insert Sixx and Lowry in that slot." He shook his head as he came back to his agents. "Volunteers?"

The poker-faced silence endured three minutes, and then the door slid aside to admit Miss Stame, and Jason Horn began to see why he had a pair of volunteers on his hands. He remembered her from her Royal Khandalar costume images in his mind as being beautiful, even to his elderly and experienced eyes. Now she was wearing something severely and deceptively simple and brief in pale blue disposable tissue, over an electrostatic body-stocking as sheer as a shadow, and he could have found the duplicate of her outfit a dozen times inside the building. It did a lot for her . . . or she for it . . . but there was more to it than that. It wasn't just her outlines and masses that made him rise and feel warmed by her smile.

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"Hello, Mr. Horn," she said. "Nice to see you again. Hello, you two."

The voice completed Horn's enchantment. It was low, vibrant, musical, and completely self-assured. He had to cough a time or two before he could regain enough aplomb to come around his desk, take her hand, and say, sincerely, "I am delighted to see you again, Miss Stame. All safe and sound, and looking none the worse for your adventures."

"Thanks to Rex and Roger, here. They took very good care of me."

"Yes." He remembered to let go her hand and coughed again. "You'll be pleased to know they are going to stay with you for the rest of your trip, and keep an eye on you, see that you don't come to any harm."

"I don't think I shall be in any danger, really, but it will be nice to be with friends. And we ought to be getting ready to leave," she glanced at the digital clock on the wall, "the transport is due in a minute or two."

Lowry offered his free arm, clamping his helmet under the other. "We're ready now. C'mon!"

Horn caught Sixx by the arm to detain him a moment after the two had gone out. "What?" he demanded. "How did you work *that* miracle?"

"Good, huh?" Sixx chuckled. "Roger should take most of the credit. He worked it out. With that supermemory of hers she's a fast study. We heard her chatting in Khandalar fluently. She learned it just by listening. Then he caught on to the fact that, by sheer coincidence . . . if that is the word . . . she had never heard herself. Not once! So, when we had a moment, he let her talk and played it back. And she was shook! The rest was simple. Joe, our computer, has quite a range of voices in his entertainment banks. We let her listen to a few, and pick out the one she liked best. It was that simple."

"That's not all," Horn denied. "She's a different person. I don't know how better to say it . . . she seems to glow, now. She's alive! It's remarkable!"

"All very simple. She's a brain, a freak, a memory. Seems everybody spotted that, and completely forgot she is also a person. Not only did we let her hear herself, we also ran a videotape or two, so she could *see* herself in action and movement . . . and she did the rest herself. What helped was that we were interested in her as herself."

"Remarkable!" Horn stared at the still open door, at what he remembered. "You know . . . if I were twenty years younger, I reckon I'd give you a run for your money, there!"

"Don't think I don't know that." Sixx told him. "And not just you, either. She is going to need protection. That's why we volunteered! Hey . . . Roger . . . wait for me!" And he was gone at a brisk trot. ■

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When your invaders come out of time—
how do you hold your territory?

Andrew M. Stephenson Holding Action

The space stress detectors had not lied. We reached Memorial Park with only a few seconds to spare. Hardly had we dismounted from our personnel carrier when the time traveler appeared. Rimbron clapped me on the back.

"Dead on the nose. Come on." We ran towards our man, feet pounding on the rust-streaked concrete of the park, the only sound in that desolate place save for the constant tumble of water in the fountain and the muted throb of the surrounding city.

The time traveler had materialized some two meters above the Fountain of Death itself, rather than over the park, which was fortunate for him as its blood-red waters cushioned his fall when gravity took over. By the time he had regained his feet we were standing by the pool waiting for him.

He was a big one, this latest visitor from the past, easily two meters tall, though his actual proportions were masked by the bulky sealed environment suit he wore. It was built to the age-old design, very similar in outward appearance to the spacesuits used on the early voyages around the Solar System, with wrist-connected gloves and helmet. His boots and most of his legs were hidden by the colored water but doubtless they, too, would conform to the usual pattern. On his back hummed a rectangular box containing his life support systems, feeding air and power to the suit through duplicate umbilicals which entered his helmet just behind the ears. Of the man himself we could see only the eyes: twin pits of blackness in which burned coals of desperation—as with all the others. In silence we studied each other across the narrow space; he in his red-stained suit, a resurrected ghost from an age we wished had never been, and ourselves dressed in the lightweight yellow-and-black of the Emergency Police—fugitives from that age. He spoke.

"I friend. See?" Hands outstretched, palms uppermost, the sign of peaceful intentions—and at his waist a buttoned-down holster, the sign of precautions.

I was fractionally nearer, so he turned to me; I suppose my graying hair may have contributed an additional impression of authority. However, Rimbron showed no offense.

"I comrade of you. We both part of same country, but different year, is all."

We remained silent. He tried again.

"You know my kind of talk, no?" As a friendly gesture, I suppose, he reached across to me and put one

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hand on my shoulder. I shook it off and stepped back out of range. He let his hand fall uncertainly. This was evidently not the kind of reception he had been expecting. They all think that the Future is simply longing for them to pay a visit, ready at any moment to drop everything and give them a guided tour. What kind of cretins are we supposed to be, anyway?

Finally he tired of standing foolishly in the water-sealed environment suit and made to climb out. Citizens' Advice Bulletin 4417-Q(2603) had made provision for that, and together Rimbron and I complied. With one hard push we toppled him back into the water, whence he emerged, dripping, furious, and shouting.

". . . Ell you do that for? What sort of place, this, where loyal unit is to be dumb-stared and thrown into water? You tell, quick!"

In returning him to the pool I had moved closer, and now he made a grab for me. I was too slow and in an instant one hand closed on the fabric of my uniform and the other hovered, red stained and threatening, in front of my face. Through the view panel of his helmet I could see his eyes, blazing with a murderous rage.

"Now," his voice box rasped, "you tell, Comrade, and you tell good and quick or . . ."

Discretion seemed wiser than civil obedience, with that fist ready to pulp my nose, and I essayed a neutral reply.

"What do you want to know?"

"Oho! So you talk Anglesk!" Determination had crept into the visible part of his expression.

"I *know* English, yes," I volunteered, although his last words had been more a statement of fact than anything else. The rule is always: Reduce the net information content as close to zero as possible. Otherwise be the Spirit of Reticence itself.

However, this conversation was tending to become not only informative but protracted; either I or Rimbron would have to act promptly to prevent him learning much during his stay, should he by some mischance get away from us after all.

I looked around and managed to glimpse Rimbron standing some distance off, speaking rapidly into his comset, before a hard back-hander across the face returned my attention to more immediate matters. The reinforcements would come when they could; meanwhile I was on my own. Nevertheless it was heartening to know that the Anchor Squad was hurrying to our aid, even if the second alarm could do nothing to increase their speed.

My assailant was demanding attention again.

Ignoring the second bruise on the other side of my face, I quickly studied my opponent, searching for weak spots in his armor. The toughened metal and plastic outer layer of the suit would effectively stop anything less than a very sharp knife, so nerve

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holds and other aspects of unarmed combat were out. That left foul play.

Perhaps I could rupture his air lines? But no, he would have plenty of time to quietly and efficiently strangle *me* before I could make any progress with just my bare hands.

Glancing downwards, I was reminded of his sidearm, and felt a surge of hope. Unfamiliar with the details of portable guns, of which I assumed this to be a specimen, I could not be sure of pressing the right button or even directing its destructive action successfully. But I had to try. It was paramountly important that he should not go home with information that might redirect the course of this Line's history; equally, I had no wish to be a martyr. Consequently ingenuity was called for, and the agent of my deliverance seemed to hang at his waist.

"Good," he grated, evidently having completed a consideration of my last comment. "Now we make words into data. You talk first." He waited.

I left it as long as I safely could, then said: "About what?"

"Which year is now?"

"2604." There could be little harm in letting him know the date.

"Where?"

"Resurrection City, British Isles." *That* should slow him down. It did.

"Huh? Oyez, Comrade you make funny talk and I hit face hard. Now where?"

"This area," I explained, waving towards the encircling tiers of buildings with one hand, "is called Resurrection City. It is situated in the British Isles." My ostensibly unoccupied other hand unclipped the pop fastener on his holster; the thickness of his suit now worked for me, as he felt nothing through it, or if he did then his exasperation distracted him.

"But *where* in Brittich Ilze?"

"I don't know the exact coordinates," I lied. My fingers were feeling within the holster for the gun while my eyes feigned guilelessness.

"About, then."

"All I can tell you is that there used to be a place called Oxford near here about five hundred years ago. Apart from that I don't have any references with which to compare present geography. I mean, well, I can't know what landmarks you already know unless you say where and when you are from, which you haven't yet." The gun handle was in my grasp now and I started to draw it out slowly so as not to catch his notice.

"Is not important!" he snapped. He shook his free fist in my face. "I think you try make slow talk. Not good procedure because I want data, much and fast. Maybe I got to shoot your comrade to get it."

"Shoot? Why?" If he tried to draw his gun now . . . I lifted it clear in one final motion and felt for the correct posture. Having seen old pictures in the Anthropology Museum I remembered that it had to be held by the handle, with the open end of the projectile launching tube pointing along the intended pellet trajec-

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tory, but how was the wretched thing worked?

"My battalion has wise words: 'Many corpses make good interrogator.' "

"I see what you mean," I replied, "but I think you'll need more than the wisdom of the ancients to complete *this* interrogation."

He frowned. "Not clear. Repeat."

"What I intended to say was that *I* would shoot *you* if—" Suddenly I found myself on my back with the wind knocked out of me. In the same motion that flung me from him the man reached for his gun. For a second he fumbled at the empty holster, then spotted the weapon several meters away from me where it had fallen after slipping from my grasp. Saying nothing, and giving no sign of the exertion it must have cost him, he vaulted the edge of the pool. In five steps he was standing over the gun after handing off Rimbron who had made a similar dash for it.

Now, I do not know how familiar you are with the practical difficulties involved in wearing any kind of heavy-duty suit, but the initiated will agree it to be a fact that they are not designed with the gymnasts of this world in mind. My man discovered this when he tried to bend down, giving me sufficient time to scramble to my feet and make a run at him.

I hit him low, behind the knees, and he folded backwards on top of me; for the second time that day I gulped air. Then his heavy boots lashed out at me and I had to roll clear to avoid a skull fracture.

A race to be first up ensued, and being more lightly burdened and unencumbered by a suit, I won. With one kick I sent the gun skidding across the concrete to Rimbron, who took possession, and with another I knocked the feet out from under my sparring partner once more. He went down again and this time made no effort to rise. We exchanged dirty looks and fought to regain our breath.

At length he broke the *impasse.*

"I am failure. I, professional fighting unit and wartech, am made not-victor by civilian. Therefore I demand execution in shame, when is time." He sounded serious about it.

"Not so fast," I objected. "Before anything like that happens you are going to answer some of *my* questions. Call it a counter-interrogation if you like."

"Not function, if not want to help, which not. Am protected by brain block against enemy interrogators."

Rimbron had come up beside me and handed over the gun. "The fellow could be telling the truth. He could also be telling only a part of it and he might be boobytrapped."

"Boobytrapped?" I asked.

"Ask him the wrong kind of question and he blows up. It's an old trick, though, of course, we don't use it." So casual was he about it, as if commenting on the weather, that I was shocked.

For my part I felt revolted by the

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very notion and said as much.

"Maybe so, but it doesn't change the fact that they used it, and worse, once. If this one is anything like the others . . . Ow!" I kicked him on the ankle and he shut up, scowling. Too late, however, for our visitor had overheard.

"People like me come, too?" he demanded eagerly. All traces of hostility were gone in a moment. "Then experiment function previously." He hesitated. "For what reason they not return at end?"

I looked at my companion.

"I'm sorry," he muttered. He didn't sound it; the aching ankle probably.

"What he done?" The time traveler propped himself up with his hands; we backed off cautiously. He climbed to his feet and pointed an accusing finger. "You try to hide shameful act, I think." Fortunately he made no move to attack us physically in view of his earlier display of superior agility and strength, but it was plain that he distrusted us and might be easily provoked to action.

I decided to stall for time. After all, it would surely not be long before the remainder of the squad arrived.

"Do you believe we have something to conceal from you?"

"Yes. I am not first volunteer who comes to this year, but Number Seven. None return. Why?"

Beside me, Rimbron's comset warbled, sparing me the problem of an immediate reply. He thumbed the "Active" switch, listened to what the caller had to say without comment, and cleared.

"They've been held up by a breakthrough at North East Six. The catapult is disposing of a twenty ton boulder that slipped through and is blocking their way. The breach should be sealed in a couple of minutes, after which they'll be with us inside another two." He glanced at the time traveler. "They want to know if we can keep him entertained a bit longer."

"Hm-m-m," I said. Breakthroughs were not news—we had long since learned to live with them—but this delay could be very serious indeed.

Here was a man from a period of Man's history when the whole Earth was a battlefield; land, sea, air and the space above it harbored Death in all its ghastliest forms. At the height of the conflict, which lasted over thirty years before utterly exhausting itself and the planet that endured it, no human being dared set foot on the surface. Even to go near was to invite destruction, for The War had become an independent entity—a senseless, coldly logical, overwhelming *process* whereby anything that lived was killed, anything moving was struck down, and anything dead was broken down for salvage to create more of the machinery that was its outward incarnation.

The atmosphere and the soil of Earth were drenched in a flood of poisons, chemical, biological and

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nuclear; the ground would foam and smoke as sluggish breezes moved listlessly over it, and at night it glowed brightly enough in places to mask the brief flashes high above in the upper atmosphere where automated dogfights came to abrupt and decisive conclusions. On the surface of the globe, indifferent to whether on land or in water, prowled the superbly efficient killing machines; beneath them lurked the Moles, the sapping torpedoes that eventually destroyed all of Man's last strongholds and the munitions factories that maintained the feud, so long since bereft of reason or purpose.

This man was a child of his times, the Twenty-first Century. His line evolved time travel later than most; now it sought to save itself thereby, but in so doing it would obliterate us and all our aspirations.

Shall we never be rid of our past?

So close was his civilization to its ultimate day of collapse that there was but the barest possibility of averting it; yet Time is a lake of mystery in whose depths strange currents move, currents that might drag us under to oblivion if we were to relax our guard for even an instant. He had come to us and must remain lest he take back some breath of information remotely capable of changing the final outcome of The War. We were here to see to it; he would try to outwit us. The eternal game of Survival, but played for higher stakes than mere Life and Death—Existence hung in the balance. We had played with Time ourselves and knew only too well the penalty for losing. Had we learned the rules better we would not now be here.

I looked at the time traveler. "Tell me what you see around you."

For the first time he raised his head and scanned the intricate façade of the city.

"Many buildings." And, like an afterthought: "Also . . . something . . . *Bragarg!* I have not the words!" One gloved hand slapped his chest. "Hurt . . . empty . . . hungriness! I see many buildings, more than in my life, but I see more—not with eyes, but with pain, in here. Is what you mean?" He walked over to the fountain and fingered the carved stone of the surround.

"We have not thing like this in Headquarters. What is?"

"It's a fountain," I said. A feeling of pity had replaced my earlier one of fear; for the first time in his life this man was seeing art. Not outstanding art by our standards, and not intended as such, but art that held within its form all those things his harsh upbringing had denied him—humanitarian emotions, abstract function, hope in the future.

And in that last lay the grisly paradox: the sculpture that so deeply affected him was the memorial to the death of his own people, all two thousand five hundred million of them, and it was our promise to do better. If we were allowed to.

"It has reason?" One hand had

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[illegible] verse from the Rubaiyat of [illegible] Khayyam of Naishapur, in its [illegible] epic of improvidence and [illegible] negligence yet, this once, [illegible] appropriate:

"[illegible] indeed. Repentance oft [illegible]

"[illegible] but was I sober when I [illegible]?"

[illegible] then came Spring, [illegible] Rose-in-hand

[illegible] threadbare Penitence apieces [illegible]

I could not tell him the truth, nor was it wise to.

"Yes," I said, and "It's for decoration [illegible]."

"Decoration." The word came awkwardly from his lips and was further distorted by the voice box. "Decoration shan. Is strange. What means?"

How do you explain the concept of "aesthetics" to someone who has no word for "beauty"? Would you need to if he did?

"Something which has no active effect that can be measured with instruments, yet helps us to live better [illegible]." I bogged down and turned to Rimbron for assistance, but he was using the comset again. He held up one finger. One minute more.

I listened to the wind, sifting the multitudinous noises borne on it for the one I wanted. There!

In the canyons of the city the sirens of the Anchor squad hurried nearer, sending feeble tendrils of sound ahead to herald their coming. The man heard them, too, and straightened up from his inspection, once more the soldier.

"You wait for someone, for comrades who come to make me prisoner! Before, when I ask what happen to others like self, you make diversion. Now I say again: *What happen to them?*" He waited, hands curled into fists at his sides.

Rimbron interceded. "They went away."

"Away?" Suspicion was gathering like a dark cloud; the approaching sirens were making him nervous. "Where? And what you do to them?"

"We did not harm them in any way." That at least was true, if you discount mental cruelty.

"Then why they not return?"

"Maybe something went wrong. Remember that experiments fail quite often. I promise you that when they left us they were in perfect health, as you will be."

"How I be sure you not lie?"

"You can't be, but why should we?"

"Not know." He trudged wearily over to the fountain where the sun would warm him from the front and sat on the stonework. After several seconds of deep thought he spoke again.

"We have not talked of why I come, or what year is mine, but already I think you know from my comrades. Is correct?"

"Er, yes." I wondered what he was leading up to.

"That is what I think. So maybe is

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not needful I should tell again. No matter, I will.

"My comrades fight great war at home: terrible years are; have been for long time, ever since I little boy. Old people say not always so, say that men able to go on top, without Baskerville come kill you quick and bloody. Is true sitreps now tell of changes for worse; enemy begin lose hope of quick victory, resort to weapons banned in Washington Accord.

"War goes on many years more, I think; no easy victory. But we not yield while energy to hand. This Time Jump I make prove it. My people, my comrades, all work very hard for long time, make this thing real. Send volunteers—like self—to later times. Hope find help.

"One, two, three, and six men go; not come home when scitechs make reverse. Still not yield; one more, say. One more. Only. Can send no more after; cost too much. If send others, then have nothing fight enemy with. So I come to you . . ." The voice trailed off into hopeless silence. The sirens were very close.

A strange noise came from the man. For a moment I was at a loss to identify it, but then I realized he was crying. I made to step forward. Rimbron put a restraining hand on my arm.

"Careful. It might be a trick."

It was just possible, so I stayed where I was. The man raised his face to the sky.

"You fear me." A statement, dull and sick with disappointment. "So you will not help."

"We will not help you," I echoed, unaccountably ashamed of our whole policy. "We *cannot* help you; you *must* understand . . ."

"Not? You will not do this thing for even your own comrades, your fathers, your own blood?"

"No." How could I tell him the truth? How?

He raved.

"I do not *know* you! Are you human, or will bombs and sprays of enemy destroy minds of our children like they destroy us, leaving . . . what? Animals? Devils? How can you say this, when knowledge of my comrades dying in dishonored thousands every watch is in your minds?" Burying his faceplate in his gloves he wept once more only to stop when the first of the squad vehicles entered the outer fringes of the Memorial Park. Straightening up, he pointed at us.

"And now you will neutralize me, like other six? You do not fight as professional soldiers, brave, duty-guided, loving Overlord and Headquarters, but as enemy units, not-brave, autoprotecting, thinking only of self, not of comrades in danger needing help!"

The yellow two-man personnel carrier glided up to us and settled in a swirl of dust and siren swan song. The riders unstrapped themselves and leaped off. One unclipped a set of Fregar cones from the equipment

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rack behind the rear saddle and hurried to set them out around the fountain. The second man waited by the control panel until the first had finished, then threw a switch.

Instantly, flaring arches of light flung themselves upwards from the ground between the cones, spreading aurora curtains behind: they climbed rapidly up and over us until, meeting and merging indistinguishably, they formed a shimmering dome completely enclosing the center of the park. We were sealed off from the outside world—nothing could pass through that shell of rainbows unless similarly sheathed. Nothing. The man from yesterday was trapped.

Somehow the uncertain fate in store for him appeared to annoy more than frighten, for he stood up and shook a fist at the two policemen who were now approaching him warily. Rimbron and I did not interfere—our part was over.

"Assassins!" he shouted. "Mercenaries! Conscript rejects! Must not all men see you at your work?"

Two other police vehicles slid gustily and colorfully through the Fregar dome and dropped, their force screens fading to extinction. One was another personnel carrier, but the second was the catapult platform on which squatted the bulk of the catapult itself. This is the axis of such operations: its horizontal transparent barrel, mounted at one end on the trapezoidal power column, is a nexus of temporal forces that permits us our control of those most intangible of universal dimensions: time.

Its resemblance to a weapon of war made the time traveler halt on the verge of another series of insults. Instead, he exclaimed:

"What! You will shoot me with *that?* Is not handgun good?"

Four policemen ringed him in as he spoke, and with practiced skill caged him in a modified Fregar field. He tried to struggle against it but was powerless to overcome the force-triggered inertia effect and gave up. Silent in his polychromatic bonds, all sounds being damped out long before they could reach free air, he glowered at his captors.

The platform started its lifters and floated across, halting beside the group. Working together the four policemen loaded their burden into the barrel of the catapult and sealed the end. Now we could tell him everything. His own people could no longer pull him back unless we so desired. We breathed more easily.

Rimbron wandered off to chat with the heavies who had effected the capture. I chewed on a stimgum, and while I was doing so the squad leader came over to me.

"Happiness, Master," he said in ritual greeting. We had met before in the course of regular police work and now knew each other well.

"And Health, Leader," I returned. "That was efficiently done, if I might say so, Meld."

"Thank you, Varno. Kind of you.

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Compliments from informed sources are always welcome." Slipping off his gauntlets and tucking them into the tops of his boots, he waved towards the time traveler in his mobile prison. "It was close, though. Most of the others have only wanted to stay five minutes, if that; they must be trying a last ditch effort, poor devils."

I nodded silent agreement. "He said he was probably the last. The energy costs alone would be enough to bankrupt their economy. I suspect that his failure to return will have been the death blow to their experiments."

"Shazol be thanked," muttered Meld. He takes his religion seriously, so I made no rejoinder but changed the subject.

"Rimbron says you hit a breakthrough."

"Yes, Over on NE6."

"Bad?"

"Not really; I'm more worried about the implications. That's the way it all started originally, if you recall."

Could I forget? Meld and I are First Generation colonists: we were there when our world began to fall apart at the seams, when the walls of Reality crumbled, admitting all the fury of history that had never been ours. For us, the discovery of time travel came early; fully ten years would have elapsed before our Line became engulfed in The War. As it was, we used our new skills to probe the future, and what we learned from these researches averted the tragic consequences of the misunderstanding that was to shatter more than three thousand alternate Lines around us, rendering them totally unfit for life as we knew it for hundreds of years. When the fatal hour had come and passed we stood alone, a peninsula of peace and sanity stretching out into a hostile sea of violent Lines. We saw whole worlds at war with themselves, civilizations that might have been our own bleeding to death in meaningless conflict, and we trembled. Frobisher and Benyon had their doubles in these alternate hells and only a narrow-variance Gaussian distribution of experimental success rates had given us our lead over our neighbors. We realized that when they, too, found the key to free movement within the time dimensions then we were doomed: The War would spread to all of Space and Time unchecked.

Hating ourselves, we made sure of their failure, and in so doing unleashed the horrors of this unnatural catastrophe upon ourselves. By the simple expedient of sending out teams of executioners we gradually achieved a false sense of security.

Yet conscience rebelled, and there were those who said that we should have let matters run their natural course; they had their vindication soon after when the fabric of quiddity tore under the strain of our hasty actions.

The months that followed, during

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which the thwarted outcomes of situations and events long past sought to reassert themselves, were an iron age of despair. Phantom armies clashed in whispered encounters, pale images of multimegaton nuclear explosions set the air shivering, and the shadow of Armageddon moved across the land. Vainly our scientists and theoreticians sought to dam the flood. History would have its way despite us.

So we made our Exodus, those of us who could in the limited weeks remaining before the visions attained solidity. Over two millions escaped: two million refugees who took what they could of the way of life that had sustained them, into the barren lands of a future Earth, half a millennium on.

I was still in my twenties, a young man working in the construction gangs slaving to assemble the factory produced Gates intended to bridge the chasm between the dying Twenty-first Century and the new world, and I saw how daily the rot spread. Towards the end I was twice almost killed by errant projectiles breaking through unexpectedly; I, who had never so much as handled a gun in a world where they had become unnecessary and obsolete.

In a way I was lucky to the last. One Gate erected and operating, my gang were moving off to the new site one kilometer away on the far side of a small town when we heard a watercraft approaching over the rooftops.

It was of a type we had nicknamed "Bumbly," a subsonic robot hunter-killer propelled by a rapidly rotating tail jet, similar to its ancestor, the Twentieth Century Spinfire. Normally we would have ignored it and other flying ghosts, but this one looked dangerously real. Our driver pulled over and asked our Leader for instructions.

The Leader squinted through his binoculars for only a second or two then yelled: "It's seen us! Get out of here . . . !"

But the driver had needed no further information. He poured power into the truck's lifters and we hung on for dear life itself as he turned the massive machine around and drove as hard as he could for the Gate we had just left.

The Bumbly tumbled along after us in a deceptively erratic course; when it was ready to take us its onboard computer would direct the main jet full astern and the final part of the attack would be swift and inhumanly accurate. The meandering flight was all camouflage to deceive antimissiles.

We were some four seconds from the rectangle of stygian darkness that was the Gateway . . . Three, two . . . A sound louder than a clap of thunder split the air and suddenly the jet was at full intensity. The Bumbly was making its run-in.

The terrified faces of fellow fugitives swept past us. Most had taken refuge amongst the broken rock and bombed-out ruins near the Gate, but

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some still tried to escape. These raised their hands in hopeful supplication; we could not stop, and left them behind.

One second. The Gate loomed up and swallowed us whole. We were through, and swerving violently to avoid the crowds that had preceded us. I looked back. A speck got in my left eye and I closed it, hoping that it would water and so remove the irritant. With my right eye I watched the Gate we had come through.

A searing light filled it momentarily and was snuffed out. The Gate frame was empty; the bridge was down and the Bumbly had stayed on the far side. But to this day my right eye is blind at the middle, the price I had to pay for Life.

Might I have to pay once more? I studied Meld for a long moment.

"Do you believe it might come to that?"

He shook his head with what I thought optimistic emphasis. "No. We've improved vastly since those days. Twenty-five years of research have taught us enough to prevent repetitions. Still, I can't say I'm happy about the possible results of *his* crowd's experiments. The aftereffects may persist for quite a while. If you remember, we chose this Line originally as being well into the low probability area for time travel discovery in order to avoid lingering stresses in Lines closer to . . . home." For an instant his voice caught, but he coughed to cover it. "Greater caution will be necessary, but otherwise . . . Please excuse me."

One of the catapult operators shouted something about 'coming on'. Meld acknowledged and turned to me.

"If we'd taken much longer getting here we'd have been too late. The people at the other end are trying to retrieve him now. So far we're winning." He smiled.

We would almost certainly continue to win.

The only visible indication of the titanic tug-of-war proceeding between the two points in the multidimensional web of Time was the faintest softening of the barrel outline, but I was fully aware that that volume of space was presently, and had once been, the intersection of colossal quantities of energy, enough to vaporize whole cubic kilometers of rock. Even so, not a murmur was heard, neither did smoke appear, nor any other traditional portent of disaster. We had been in the game too long for that to happen at our end; sometimes I wonder what caused the Bowl, in which Resurrection was built, and what installation incorporated the rusty concrete of the park, but it is more than likely that a Mole was responsible.

The struggle lasted only minutes. Abruptly the barrel snapped back into focus. They had given up. The next task was to dispose of our visitor humanely. But first he would have his questions answered.

He was launched into a hitherto unexplored volume of Frobisher-

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Benyon space, but one in which we were convinced he would find our kind of human beings and a new life. Whatever he found would be better than that which he had been deprived of.

As for us, we sat on the running board of the platform, letting the tensions of the day ease themselves out of our bones in talk and quiet enjoyment of our peaceful life. A bottle of euphoriant appeared from some cache and was passed around without official comment, and with the spreading glow it brought came the reminiscences.

The younger men bragged of the assignments they had been on and the dangers they had seen. One told of a Field Trip he had gone with, out to the fringes of human F-B-Space. None of us really credited his tale with much in the way of accuracy, reserving our true opinions and applauding his narrational skill.

Rumbron described how we had delayed the time traveler, being somewhat overgenerous in his account of our brief wrestling bout, and this led on by common consent to recollections of the Old World. Meld talked at length, his strong voice graphically conjuring up the collapse and the struggle to rebuild in the New. Throughout it all I kept silent, not daring to trust my self-control should I begin to revive my personal history. I am naturally an emotional person, and the liquor was making us all slightly maudlin by now.

Someone proposed a toast to our future happiness. The idea caught on and soon we were toasting anything and everything. I do not yet know how the flask held out—or had we started with a bottle? I could not recall. We drank to each other's health, the new-born son of one of the men, the Senior Commisar's dog, the Citizenship generally . . . a great many variegated and usually irrelevant things and people. But a serious note crept in, and the proposals were now to memories loaded with regret: the Old World; the unsung heroes, martyrs and unfortunates trapped there when the final breakthrough came; Jacob Frobisher and Thomas Benyon, both dead these twelve and fifteen years; friends and relatives amongst the casualties . . .

I stood up unsteadily, and in my mind burned the unspoken thought common to us all, ever present, a burden of sorrow:

"Citizens," I said, "let us drink to the Past."

They all got up, somehow, and raised their assorted drinking utensils.

"The Past: May it never die, but let it never live again . . . Wait."

Lips shaped to receive the liquor, they paused and stared questioningly at me.

"In addition" my throat was tight with not altogether alcoholic emotion—"I propose a final toast: The Last Time Traveler, and the hopes he represented."

We drank, long and deeply. ■

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Chinoiserie was a glorious world. The people were as amiable as puppies full of milk. Roslyn Martin was almost ashamed of her sense of outrage as she walked through the crowded spaceport. She plotted her course to avoid statuary, schoolchildren, fountains, athletic clubs, exhibits and the groups of contented men and women. She could not stay angry with them because they were unresponsible, they didn't care, and every evening they were filled to the ears with love, direction and affirmation from the emotivators.

She had challenged the system. She had unleashed the dogs of war. She had pushed the panic button, and she was afraid.

She walked among the brilliant flowers that ran the full length of the building. Because she was alone, people drifted toward her. They always wanted to be in touching range. An individual was subconsciously disturbing. She leaned against the low wall and looked up at the handsome step structure of the spaceport building, rising in garden terraces against the hill. It was breathtakingly lovely. The oligarchy was devoted to dramatic beauty. It was ruthless in pursuit of the good life for all people.

She turned back to the immense expanse of the port. The high, cream colored walls of the detention compound were to her left. The crane in the center of the complex was motionless, though an orange light blinked on top of the boom. The freighter, *Far Trader*, was forlorn in the impound area. Her crew had been jailed in cynical mockery of law and equity.

Across the spaceport were warehouses and factories. The great gantries of the shipfitters cut the sky to

The Nothing Venireman One by W. Macfarlane

One shouldn't judge a book by its cover.
And even less should one judge an Agent!

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her right. It was a peaceful, industrious scene, with trucks and buses at their appropriate levels in the sky. She shivered in anticipation.

The dreadnought would sink into the multilayered concrete, enormously heavy to provide the protective mass for every soldier. Wash the troops with flame and the million million kilotons would turn the barest fraction of a degree warmer. Impact weapons had the effect of throwing a pillow at a mountain. With transposition screens, atomics were futile. And out of the ports would swarm the thousand soldiers of the ship, ready and able to crack an egg, or a city, on command.

An orange spark appeared in the sky and her breath caught in her throat. She thumbed the speaker button on the wall. ". . . Will land from Ardlon and Nyretin. Earthship *Charity* follows. To the southwest you will notice lights revolving around the cylinder transport and the pilot craft above in warning alert—"

A group of youngsters surrounded her, a gaggle of ten-year-old boys. "Maybe he's green . . . You're silly he's spotted . . . They look just like us except they're always lost . . . Earthmen smell funny . . . They're always alone . . . They can't stand each other . . . All the smarts went away and left the stupids behind—"

Chinoiserie equals conformity, she thought, and watched the cruise ship settle to the fused concrete. It was painted gaudily in fine colored stripes and the outside speakers were playing a schmaltzy farewell-until-we-meet-again tune. The boys were still chattering. ". . . What a litty-bitty beetle . . . What do you expect when the dumbheads stayed home . . . Don't even have emotivators—"

Roslyn Martin was numb with shock. This was no battleship. It was a little gray bug, drifting down to land beside the fat passenger scow from vacationland. It was well out of the diplomatic area and the pilot craft honked and blinked, and then shrugged sideways and went off about other business.

The port authority could care less. Not a single pair of guards went out to meet *Charity*. In her red report Roslyn had given the evidence and concluded, "Our response should be logical, reasoned and overwhelming. If no action is taken, I foresee a continuing series of immoral incidents. Blackmail will escalate. I recommend punitive measures."

The response from Earth was prompt. "Concur with your judgment. Expect implimentation. A commendation has been entered on your record."

The port opened and a man in trucial gray stepped hesitantly to the concrete. He was medium tall and skinny, and he had a small pot belly. Roslyn grimaced and the situation got worse immediately. With fascinated horror she watched him wander over to the crowd of debarking vacationers. He was heading toward

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inspection between two smirking, overblown women wearing the transparent net holiday costumes from Ardlon.

Two guards cut him out of the line. They expostulated with him. They tried to explain. He drew himself up with all the dignity of injured ignorance. They foamed him. They held him there with the great bobbling mass of green foam on his shoulders until the powered chair trundled over and hit him in the backs of the knees. The guards programmed the chair and the fat ladies giggled and joggled at their remarks.

The wheelchair had a worn bushing. It chattered and veered as it headed toward the diplomatic entry port. Roslyn Martin hoped the man would be sick. You had to chew the foam to get the entrapped oxygen molecules. When you exhaled, your breath crawled over your skin in a nasty, sleepy way. The atmosphere inside the green mass had already lost its sparkle, hardened into the flexible membrane that shrank as the oxygen was used. It was whispered that years ago a man had chewed the nozzles and died encased in the tough green film. She hoped he was sick.

She was a Venireman Five, head of the department on Chinoiserie, and she felt sick herself. She watched a bubblebug on the wall, huffing and puffing, straining hydrogen from the air. It would take a while to defoam and dry off her idiot envoy, so she watched the bubblebug until it drifted up over the flowers. It was not easy to be a Venireman. It took a peculiar habit of mind to make recommendations without fear or favor. She had no authority, but total access to information. It was a lonely job. It had some compensations—such as the report she would write on *Charity* and its driver. She sighed and went into the building, just in time to meet the envoy. He looked like a newly hatched chicken, damp and a little puzzled. She introduced herself.

"I'm Fedrik Dubrey," he said, and kissed her hand. He had dark-red hair fading back in a widow's peak, and an air of languor she suddenly mistrusted. Away back in his eyes was an imp of mischief, an almost invisible demon of fire. She inquired about his luggage. He yawned and said, "Hardly worth the trouble. I'll do something about your business and shove off."

"Injustice," she said. "Blackmail. And you're going to shove off?"

"Where's a bathtub?" he asked. "They've rebuilt this place since I was here last. Don't trouble your pretty head, Popsy. We'll impress these people somehow."

She led him past the underground to the surface terminal. He could waft his way through the crowds as well as she, and he stepped into the lozenge as if he expected it to squirm under him as it did. The little computer took her card and went *click-click*. She tapped out the address of the embassy and off they went. He

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was right. It did look like a bathtub. It followed the meter-wide fused concrete path without hesitation and gently increased speed as it swung into a tunnel.

"Would you like to tell me the trouble?" he said.

She looked at him without hope. "The Chinoiserie abrogated the treaty. They did not even bother to manufacture excuses. They foamed the crew of the *Far Trader* and put them in detention. This is kidnapping and blackmail."

"What do they want?"

"A twenty-five percent across the board increase in the price of their exports. It's a unilateral decision. The crew is in bond for the concession."

The bathtub ran smoothly out of the tunnel into treetops and across a tumbling blue river. There were a hundred other tracks crossing at all levels. A twenty-meter underground car slid by below them into the grids, but their own track met higher ground between two levels of a vine-covered building, hesitated for other cars and picked its way to a single track through the cursive city.

"Kind of a pleasant, crazy place, isn't it?" said Dubrey.

"Our men are on the native diet and denied entertainment—"

"Does everybody still eat that nutritious slop? Very efficient. The last time I heard, it figured out to fourteen cents per person per day. Food piped to every dwelling and it's free. How can you beat that?"

"They're denied entertainment food, too."

"Oh sure, and they put them in an acre of plastic sawdust. Very practical. Low cost, low maintenance, frightfully dull. I suggested ditches to the authorities, but they pointed out the drainage problem and I suppose they were right."

"It's subtle and refined cruelty!"

"A jug is not a pleasure resort," he said gently.

Roslyn seethed and held her tongue. They went into a vertical park, colorfully planted, and turned a corner to a vista of brilliantly swirled and patterned buildings. They crossed another stream feeding a lake with pleasure groups on rafts, onto a dosey-doe transfer area, and off again into a red tunnel on a track that finally led them to a portico of Earth embassy.

The Ambassador was a man of great dignity. He was a graduate of the finest diplomatic schools. He had learned on half-a-dozen planets that properly documented inaction is the first function of the corps. If action cannot be evaded, do as little as possible in other than pertinent areas. The highest art of the diplomat is to provide maximum solutions to individual parts of a problem. It then becomes insolvable and the partial solutions offer endless defensive positions.

"If it is not too brusque—it's not that I want to pry—putting your cards on the table is often an aid to

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understanding. What is your rank?" He hastened to add, "Established values are open."

"Venireman One," said Dubrey and put his card in the assessor box. He set his hands on either side and looked into the viewmask.

"That's all very well but the delicate situation—what? One?" He gobbled like a turkey. "Roslyn Martin is Five and she's in charge of a planet—I'm Administration Four myself." He cleared his throat portentiously and found he had nothing more to say.

"This is Dubrey all right," said the assessor box in a gritty voice Roslyn had never heard before. "Watch your coat, check your wallet, count your silver." The voice grew fainter as if the speaker had turned away. "How's that, Freddy?" He spoke into the mike again. "Unlimited responsibility."

"Diplomatic microdot readout," murmured Dubrey. "Sometimes I think the Chief has a warped sense of humor."

The Ambassador stood at attention and saluted the box. "Yes, sir," he said.

"Yes, sir," echoed Roslyn Martin. How could this nothing fellow be a Venireman One? A Venireman was a serious person. She followed him to the door and led him to a lower floor where he said he wanted to visit the furniture shop. He ambled along beside her, his potbelly joggling comfortably.

"Government holds power with the consent of the people," he said. "Right?"

"This government holds power by emotivation. I suspect drugs in the food and I know the psychodrama is slanted. The people are enslaved. The rulers are despots."

"Something like that. And your complaint against a friendly—"

"The friendly oligarchy seized the *Far Trader* and flung the crew into jail. No trial. No recourse to law."

"What is the law here?"

"Whatever the oligarchy says it is."

"So no law is broken, Popsy. The only violation is to your sense of justice."

"It's not fair. It's not right!"

"The trade amounts to almost 8 hundred million dollars so each crewmember is worth 50 million. Looked at another way, each man is in hock for 12.5 million. Pretty valuable."

"It's the principle. It's wrong."

"I agree. Twenty-five percent is much too greedy. This the furniture shop?"

While weight is of small consequence with antigravity, volume for a planet-landing ship is always at a premium. It had proved more economical to carry molds to the stars with foaming plastic in bulk. By compositional changes in the material, it was easy to make mattresses, or chairs, or tables where they were needed.

Dubrey chose a three-cylinder repair kit, checked each tank, adjusted

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the valves and nozzle, and discarded the metering gear. The assembly weighed about thirty Earth kilos and he swung it to his shoulder without effort.

"Now we grab a bathtub," he said.

Roslyn maintained silence as he hauled the equipment through the embassy. She pushed the call button and when the car arrived, she waited for instructions with a set face. He heaved the cylinders into the cushions with the nozzle sticking out the back. "We'll go to the perimeter and swing in diminishing circles back to the embassy. I don't want to travel the same path even once."

He had posed the girl a complex problem and the little computer was clicking away as she punched in new data. Her card was constantly changing as a destination was deducted from the balance, credited when the trip was aborted, changed again when new coordinates were fed in. She was so occupied that it was a good half hour before she noticed the thinning traffic.

The grid cars under the city were free. The surface transportation was a mark of status. Because they were conspicuous consumption, the lozenge cars were always used by the wealthy, or for entertainment, or special holiday treats. Roslyn had never seen the carways so free. There was no hesitation at the interchanges. She looked around in surprise and discovered Dubrey tapping the discharge lever. A glop of foaming plastic dropped to the track and writhed to the size of a half basketball.

A following car stopped and the lights began to blink. The sensors would not allow it to proceed with an obstruction ahead. Two guards jumped out and one tried to kick the hemisphere off the track. Roslyn forgot to change the coordinates while she watched him kick the obdurate material. His leg slipped out from under him and he sat on the end of his spine. His voice faded in the distance, "Ow-ow-ow."

Their own obstruction sounder began to ululate and lights began to flash. "Why don't you pay attention?" asked Dubrey sadly. They had come to the end of a line of cars, all stopped by a maple-colored glob ahead. "Now is the time to run," said Dubrey.

She was confused and angry. Curious faces peered out the windows. "What have you done!" she said.

"Got their attention. Here they come." The two men were running down the track, one of them limping. Dubrey hauled Roslyn out of the car and ran like a rabbit to the nearest building. He pulled her through the crowd at the entrance, located the elevator and pushed her in. Down they went to the underground grids. A car pulled to a stop and they hurried aboard to the mild curiosity of the other passengers.

"Have you lost your senses?" said Roslyn.

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"I figured spitting on the sidewalk wasn't good enough," he said with a grin. He lost his grin at the next stop. A squad of guards grabbed them and foamed them.

It was green foam, but Roslyn had heard rumors of a laboratory working to incorporate skots, for example, into the mixture. They were a minute carnivorous bug. As she chewed the foam she shuddered at the idea of skots in her lungs and skots on her skin. They would meet at her heart. She wished she had told Dubrey about them.

She grew hotter as time went on. They had been foamed for total immobilization and she was beginning to mistrust her body, not certain if she was on her head or her heels. She was being moved somewhere like a package. It was hard not to become disoriented when you were cut off from sensation. All she could hear was her surging blood. She could see nothing. In the complete privacy of her cocoon, to avoid panic, she reviewed her two-hour association with Fedrik Dubrey. As a trained observer with field experience, she could come to no conclusion. She hoped there was reason somewhere in his wild actions.

Hours and hours passed before there was contact with the outside world. Her left foot was wet. Suddenly she was free of the foam and dripping. Someone wiped her eyes and she composed herself to meet the Commerser guards.

She stared at a sorry-looking lot of Earthmen. They had straggly beards and rumpled clothes. She was in the shadow cast by a 20-meter wall that tilted toward her. She was in a prison pen with the *Far Trader* crew. She sat up in the damp sawdust, relieved that she could see and hear and feel again. Not that there was much to see. In the center of the compound was the feeder. There were two depressions in the top, one full of nutritious slop, the other with water.

". . . They drop you in with the crane," the captain was explaining to Dubrey. "When they want you out, they send down a sling."

"Any idea which pen we're in?"

"Nope. All foamed. They squirted one man and he cleaned up the rest of us with solvent in containers like the one they sent down with you. They disintegrate when they're empty. The slop fountain over there is very clever. Empty the holes and in five minutes they fill again. The pedestal is soft. You can't even commit suicide in here."

"Do any digging?"

"Maybe you could bury yourself at that. We got down about six meters before we had the spoil pile at the angle of fall, so we tried piling this soft junk into a corner. Got up about six meters. It's really quite a smart system, but we're glad to see you. It's been dull."

"Surveillance?"

"Why bother?"

"Then let's bust out."

Dubrey opened his tunic and

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reached to one side of his potbelly. "Damn-damn," he said. "Stick your fingers here and pull." His stomach peeled off and he rubbed his lean belly with both hands. "Hot and itchy," he explained.

"I hope we're not more than four walls away from outside," said the captain as Dubrey split the flexible pink material into four slabs and handed three to him.

"It's a sixty-second delay after I strip the back. Everybody line up and tumble smartly through the hole." He plastered the pink patch to the wall, taking forever to smooth the edges. There was a quick, shattering bark. The restraining membrane dissolved under the effects of the fumes. The hole was circular and about fifty centimeters in diameter. "Briskly now," said Dubrey.

The wall was two meters thick and the hole on the far side was two meters wide. Roslyn was dazed by the immediate action and Dubrey pushed her through to another prison pen. "Can't delay," he said, "the stuff is self-repairing." She looked back and the hole was filling in as she watched.

They walked across a compound absolutely similar to the one they had left, though the prisoners were huddled apathetically in a corner. Dubrey slapped on another patch and the new hole opened onto the spaceport. They all scrambled through and the captain lingered while the crew trotted over to the *Far Trader.*

"Can you get in?" asked Dubrey.

"We always leave a key in the mailbox. You going to be all right? Lots of room aboard."

"We're running on schedule according to plan. Take off," he said. The captain followed his crew. Dubrey turned his back to the wall and stuck one foot into the rapidly closing hole. Roslyn gasped and ran to him. "You want to stick around? Clench your teeth," he said. He popped her precisely on the chin.

She woke into a nightmare. She was inundated by a feeling of fawning abasement. She had been dumped like a wet towel into a chair. In front of her, through gold-wire glass, she saw Dubrey. The emotivator pickup was focused on him, cringing from the noble figure in the center of the setup. To her right was a repeater screen and it was from this that the emanations of loathly cowardice and slimy repentance were pouring. The attention of the screen turned to the radiant man who exuded stern nobility. The technician beside her adjusted his gains. Nobility raised an eyebrow and the technician said, "Hundred-a-hundred, Noble Leader."

"Time?" asked Nobility.

The technician held up four fingers. Dubrey groveled on the floor. His legs no longer supported him. Roslyn felt sharp anguish for the representative from Earth. Under the eyes of the leader, Dubrey began to sob.

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The monitor to her left was putting out simple dignified sorrow at the puerility of rapacious Earth. The small Chinoiseriens had been duped and swindled, but the shameless exploiter had been brought to judgment. The technician counted down the last five seconds and pointed.

Golden emanations of love poured from the repeater. The master spoke of the generosity extended all races of mankind, and how this fairness had been broken, how morality and right thinking were compromised by the depraved actions of the primitive home planet.

There was a faint trickle of amusement. The technician tapped his dials and worked to phase out the random emotion. Roslyn was bewildered by the thin tendril of laughter running like a thread through the projection. She was numb with confusion as the Great Man turned to the despicable figure in crucial gray.

Then she went blind in white light.

The projection was of a totally different order. The lean figure in gray was stark reality against the quivering mush of the Noble Leader.

In panic the technician fumbled with the controls instead of chopping off the transmission, and then it was too late. He managed to drop the volume, but intensity is not a function of volume. Dubrey was hot crimson instead of pink pastel, a mountain lake cold not a scented sauna. His thought projection was hard, clear and overwhelming.

He spoke of man's leap for the stars, how ten thousand ships lifted to ten thousand planets. How Chinoiserie had been settled by communications experts and built a distinctive society on the base of benevolent authoritarianism—but a static society boxed itself and circumscribed the potential of man. Old Earth had no commands, no suggestions to make. But since Earth had a lot of experience, it was her obligation to point out these things to her children.

He nodded to Roslyn. She chopped the switch. All transmission stopped. He joined her in the control room and pulled the main fuse box. The technician remained in shock. So was she.

They caught a car and went through the hill to the spaceport. She looked at him with new eyes. "Revolution?" she asked.

"A gentle kick in the pants to the future is all."

The car stopped at the port. "Take me with you," she said.

"Better stay and see how this works out," he said kindly. "You're a Venireman Five, remember? Stick around and help." The whole dreadnought fleet was not so heavy as the responsibility, world heavy and feather light, she saw in the back of his eyes.

Roslyn Martin stayed to watch Venireman One walk over to his little gray beetle. She was a little mixed up. She thought the planet moved away as the little gray ship lifted. ■

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P. Schuyler Miller

the reference library

THE GREAT "OLDIES"

My antiquarian tendencies are responsible for Michael Shoemaker's undertaking to compile a list of the best science-fiction short stories published before 1940, in addition to the list of all-time great short SF we reported last month. He warned me that too few readers would send in lists of "oldies" for their selection to have much statistical validity. He was right: only thirty-three of you participated. He predicted that the vote would be even more scattered than for the all-time bests. He wasn't far wrong: you nominated 318 different great old stories by 141 different authors, compared with 1,680 stories by 351 authors in the main vote.

Some other odd things happened that neither of us predicted. In number of stories nominated, H. G. Wells led with 26 and John Campbell came second with 17—as "Don A. Stuart". In total votes, though, John was 'way ahead with 101 votes and Wells tagged with 62. But Dr. David H. Keller was third in number of stories (12) and Jack Williamson came seventh with 9 . . . yet neither of them had even one story on the final list. Runners-up in number of stories nominated are Edmond Hamilton, Murray Leinster and Stanley G. Weinbaum with 10 each, and L. Sprague de Camp and "John Wyndham" (John Beynon Harris) following Jack Williamson with 7 nominations. Weinbaum stands third in total votes (53) and Leinster fourth (46): below them the vote was too scattered to indicate anything.

We allowed you to vote for series of stories and, as I did last time, I'll pull those out of the final list and report them first. There are three: Stanley G. Weinbaum's Ham Hammond series ("Parasite Planet," "The Lotus Eaters," and "The Planet of Doubt"); L. Sprague de Camp's series about Johnny Black, the bear with accelerated intelligence; and a real oldie, Murray Leinster's "Mad

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Planet" stories ("The Mad Planet" and "Red Dust") about a future with gigantic fungi and insects. I think A. E. Van Vogt's Space Beagle series would have made it too, as it did the all-time list, except that "Black Destroyer" is the only one of the series published before 1940; it got 13 out of the 33 votes, as did the Weinbaum series while the Johnny Black series got 8 and the Mad Planet series 6 out of 33. That is as far as Mike carried the lists.

But let's get down to statistics. John Campbell leads the pack with two stories, "Who Goes There?" and "Twilight," both on 25 of the 33 lists you sent in. Weinbaum's "A Martian Odyssey" had 20 votes. All three are on the "all-time greats" list. Lester del Rey's "Helen O'Loy" nearly tied Weinbaum; it got 19 votes. And John Campbell's "Night" (17 votes) and "Forgetfulness" (14) bring us to the 50% mark.

Mike Shoemaker carried this list down to about one-sixth of the vote in order to get a reasonable list without getting into unmanageable proliferation. Van Vogt's "Black Destroyer" and John Wyndham's (John Beynon Harris') "The Lost Machine" shared the 13-vote niche with Weinbaum's series, and one of the only three stories Isaac Asimov published before 1940—our cut-off date—"Marooned Off Vesta," got 12 of the 33 votes.

I am pleased to find my own "Sands of Time" sharing the 11-vote spot with a real classic like E. M. Forster's "The Machine Stops," but I have an idea the vote is a pat on the back for this department. Murray Leinster's "Proxima Centauri" and H. P. Lovecraft's "The Colour Out of Space," both with 10 votes out of the 33, are both better stories.

In the 9-vote niche we have Philip Francis Nowlan's original Buck Rogers story, "Armageddon 2419 A.D." and Robert A. Heinlein's "Life Line." Robert Moore Williams' "Robot's Return," Weinbaum's "The Adaptive Ultimate," and Eando Binder's "I, Robot"—the first Adam Link story—got 8 votes like the Johnny Black stories.

Although H. G. Wells stood first in number of stories nominated and second in number of votes, only two stories—"The New Accelerator" and "The Country of the Blind"—got as many as 7 votes ("The Crystal Egg" also makes the list with 6). They are tied with Henry Hasse's "He Who Shrank," Murray Leinster's "Politics," Sprague de Camp's "The Blue Giraffe," and Lester del Rey's "The Faithful."

By now we may be beginning to pick up the old-timers' vote—of which more in a moment. The final category—6 votes out of 33—in addition to the Wells story, has C. L. Moore's "Shambleau," R. de Witt Miller's "Within the Pyramid," Lovecraft's "The Shadow Out of Time," Leinster's "Sidewise in Time" and "The Runaway Skyscraper," Ray Cummings' "The Girl in the Golden Atom" (!!!), Leinster's

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Mad Planet series, Raymond Z. Gallun's "Old Faithful" and "Seeds of the Dusk," and Edmond Hamilton's "He That Hath Wings."

I used the various indexes to check first-publication dates. Only one story, Wells' "Crystal Egg," antedates 1900. Five were published between 1900 and 1920, seven between 1920 and 1930, thirteen between 1930 and 1935, and seventeen in the "Astounding years" from 1935 to 1939.

Mike Shoemaker's comment on the list is: "most younger fans—even those around 30—have not read many of the older stories." He's right, and I think it explains the kind of list we have. The only old science fiction today's readers have ever seen are in a few anthologies . . . and the reprints in *Amazing Stories* and the flock of reprint magazines with which Amazing's publisher has blanketed the newsstands.

Even with this flaw—and it's a major flaw—I think this is a better list of early stories than the SFWA has in its "Science Fiction Hall of Fame" anthology. Wells' stories . . . Forster's . . . Lovecraft's "Colour Out of Space" . . . Leinster's "Mad Planet" duo are certainly equal to or better than some of the more recent stories on this and the "all-time" list, and they were all published before 1930 . . . before you forty-year-olds were born, let alone the superannuated 30's.

No apologies, then: but Mike was right. We wouldn't do it again.

THE NOWHERE PLACE

by John Lymington • Doubleday & Co., Garden City, N.Y. • 1971 • 210 pp. • $4.95

What you remember of a good English film—even a poor one—is often the bit parts which nameless actors and actresses have brought vividly to life. English novelists have the same talent; they can handle an imposing cast of characters who would be flattened into cardboard puppets by most Americans.

Though this book has a nominal scientist-hero, investigating the strange phenomena in the village of Weston Abbas, the people of the village are the ones who matter. In particular, a small circle who are receiving peculiar poison-pen letters as the story begins—letters from someone who has been reading their most deeply buried thoughts. But, before the letters are delivered, the village has vanished for a time.

Gradually the various phenomena are keyed together and begin to form a pattern. A maliciously irresponsible delayed adolescent playing with electronic dynamite is at the center of the matter. Vegetables ripen, cows calve, and weeds go to seed overnight. A poltergeist cavorts and nude figures dance in the village square. Radio and television run wild and there is a feeling of "earthquake weather." And in the end the black Something from somewhere in the universe, who has picked up the amplified signals of troubled minds, probes to see what is going on.

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I have seen only about half of John Lymington's books. This is by far the best of them.

QUEST FOR THE FUTURE

By A. E. Van Vogt • Ace Books, New York • No. 69700 • 253 pp. • 95¢ • Science Fiction Book Club • 180 pp. $1.49

One of the more pleasant developments of the last few years has been the return to activity of a number of writers who really shaped science fiction of the "great" days, mainly in this magazine. This is the best, so far, of the "new" Van Vogt yarns. It isn't in the category of books like "Slan," or the Weapon Shops or Null A series, but it has some of the old flair and sweeping concepts. In the early chapters, before the shape of the action becomes too frenzied, it has a nicely unraveled mystery.

The story begins when various people see a number of short films that could not possibly have been made in any place or time known to men of our day. One trail leads to a film exchange, another to the company from which a high school teacher bought a peculiar film projector. It is the latter trail that really grows tangled, leading in and out of a place where different doors open into different probability worlds, where past and future lie side by side, and where a group of supermen, the Possessors, are weaving their intricate and inexplicable webs.

The teacher, Peter Caxton, comes about as close to being an anti-hero as you'll find in a science-fiction yarn, but you'll find yourself swept along with him in spite of yourself. And when an explanation does come, it is clearer than it used to be in some of Van Vogt's older books, and has all of the loose ends tidied away. Van Vogt actively dislikes my saying that he created a kind of archetype for the "wheels within wheels" plot—the kind that is rather like going up in a ferris wheel, with the entire landscape changing every time you get to the top. I'll retract, if that's the way he feels about it. Actually, the first master of that kind of story that I can remember was Harry Stephen Keeler, the unique mystery writer, who as I recall—if I recall—made the same story do for two or three books with totally different solutions in each book. But Keeler didn't write science fiction.

Meanwhile, it's good to see Van Vogt back and in there swinging.

(You'll note that I've listed a hardback Book Club edition with the Ace paperback original. After far too long I've discovered that Doubleday, who runs the Science Fiction Book Club, publishes hardback editions of a number of books that originated as paperbacks, and occasional books that nobody else has had. I'm not going to review the Book Club originals here, because you can't buy them unless you are a member. Bookstores simply cannot get them—except that used-book dealers may get a copy now and then. These

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Book Club originals have new jackets in most cases, plus original illustrations by good artists . . . I joined to get the Edgar Rice Burroughs Mars books with new Frazetta illustrations. They are well made—better than some hardbacks you'll see at triple the price.)

APEMAN, SPACEMAN

Edited by Leon E. Stover and Harry Harrison • Berkley Books, New York • No. N-1819 • 384 pp. • 95¢

This blockbuster of a theme anthology is one I can unreservedly recommend. I don't know how I managed to miss the Doubleday hardback edition in 1968, but the paperback—which I discovered rather late—is a bargain in every sense. Leon Stover is an anthropologist, and Harry Harrison knows good stories. Unfortunately, it would take this entire department to give you even a glimpse of the twenty-seven selections which show us man—and other beings—of the past, present, and future.

These are not all stories, and they come literally from all over. There are serious articles by such authorities as Carleton S. Coon—on man of the future—and Earnest A. Hooton—on how we got the way we are—plus an assault on Heyerdahl's Kon-Tiki myth by an expert on Pacific archeology and anthropology, Robert C. Suggs—he's just as hard on other professionals, honest he is. There is a Peanuts cartoon, and a poem or two, and a delicious little "in" joke that will probably be appreciated only by archeologists. "A Preliminary Investigation of an Early Man Site in the Delaware River Valley," by Charles W. Ward and Timothy J. O'Leary.

Of the stories, I miss most Isaac Asimov's "The Ugly Little Boy," which really belongs here. Analog/Astounding has contributed Jerry Shelton's "Culture" from 1944, Lester del Rey's "The Renegade" from 1943, Robert Heinlein's "Goldfish Bowl" from 1942, Sprague de Camp's "Throwback" from 1949, Morton Klass' "In the Beginning" from 1954, Julian Chain's "The Captives" from 1952, Chad Oliver's "Of Course" from 1954, and, of course, H. Beam Piper's "Omnilingual" from 1957. (I've probably overlooked some, at that.)

The selections come from such varied sources as *The New York Times* (a poem), *Scientific Monthly*, *American Anthropologist*, *Army*, and a book called "What We Did to Father," by Roy Lewis, that I've got to find. You'll find H. G. Wells, Arthur C. Clarke, Damon Knight, and Dean McLaughlin also represented.

Individually, some of the stories and articles may be familiar. Collectively, read from page 9 to page 381—there's a short bibliography—they add up to more than you might suppose. And don't skip Stover's afterword.

I'm sorry I'm three years late with this . . . but the paperback is still around.

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brass tacks

The following comments were selected to reflect the thoughts and reactions of new and long-time readers and authors.

Analog Staff:

John was certainly the most colorful and the most important single personality in the history of science fiction. He was one of the two greatest and most popular science-fiction writers of the early 1930s. He was *the* greatest and most influential science fiction editor of all time. He created the modern field by the sheer flood of his ideas and his genius—and incredible industry—in finding and developing the writers who could handle those ideas.

But *my* loss is not that of science fiction in the abstract. My loss is a personal one. I have lost my literary father, the man who found and molded me, who was the direct and necessary influence in my writing of "Nightfall," of the Positronic Robot Series, and of the Foundation Trilogy.

Nothing I have ever written, whether he was directly involved or not, whether it was science fiction or not, fails to carry the impress of his influence—and (however we may have disagreed in our social views at times) of our deep friendship.

ISAAC ASIMOV

—An Appreciation.

The sudden and early death of John W. Campbell has come as a heavy blow to the world of science fiction. We never had anyone quite like him and never we shall again. Every human being is unique but some are more so than others and John was in this latter class. He towered like a giant above the ordinary mass of us and it was largely under his aegis that we were brought—or, in some cases, dragged—from the comparatively primitive days of the 1930s and into today's far larger science-fiction world.

John Campbell's virtues far outshone whatever human faults he may have had. The latter were given some publicity by the petty-minded and the envious. The former remained well-concealed; for John was essentially a modest man. People who did not know him personally could be misled by his liking for ruthless argument and his sly needling of opponents, all of which arose from his love of discussion and his pixieish sense of humor.

For thirty-two years I had the

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honor of counting John Campbell a personal friend. We met several times and corresponded extensively. His letters often ran to 3,000 words. Never on any occasion did he mention the endless help he gave to authors, old and new alike. That help, to say the least, was generous.

He distributed in all directions basic ideas for stories that he could well have written himself, to his own profit and glory. He was visibly pleased whenever recipients made something of them, publishing them without a hint that the inspiration was other than the writer's own. He fought to maintain a policy of quick decisions and prompt payments when this was indeed a rare feature in the science-fiction market. He kept word rates as high as he could reasonably afford, often paid over the odds for any story he thought above average, and finally made this a regular feature by creating his AN LAB bonus system.

Most folk will listen eagerly to people whose opinions they happen to share. John would listen to anyone but had an especial fondness for those whose views were contrary to his own. He fully enjoyed an opportunity to beat up the culprit with a mass of bewildering arguments full of off-trail angles and idiosyncratic conclusions. This was always done with much imagination and some crafty humor, never with malice.

Apart from his exceptional talents as an editor, John was an author of considerable status in his own right. His long-ago stories under the Don. A. Stuart by-line will continue to be remembered. His numerous editorials, which often enrage the few to the amusement of the many, will remain part of the history of science fiction for years to come. They were tantalizing stimulators of a kind badly needed in a mentally-conditioned world.

Now John Campbell has taken off on his own exploration of the infinite. He has become, like an old and experienced space scout, suddenly lost in the faraway reaches, beyond all hope of recall. What can we do, what can we say? There is nothing left but to express our regret at his passing. I, for one, am deeply sorry.

ERIC FRANK RUSSELL

Dear John,

I told you in San Francisco at the Baycon—the only chance I had to meet you—that you were one of the prime literary influences in my life, and I still say that, without shame. For though I grew away from you in subsequent years, finding my own path, you were one of the major people to get my ball rolling, so to speak. I haven't agreed with you very often, lately, but I won't bring those points up here, because I know you'd like to reply to them, and now you can't. But perhaps you know as well as I that the greatest things we leave behind us in this world are not those who were our disciples, but those who take what we had, and carry it

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several steps further. An exchange of not positive or negative charge—but momentum, which is conserved, no matter what direction it leaks off in.

I'm not quite twenty years old, and I have no real idea what I'm going to be. I have hopes of being a writer, hopes which I've tried to foist on you since the age of fourteen by submitting manuscripts, not a one of which you accepted. But there were letters.

But whatever I become, there'll be a small part of you in me. You may not agree with all the ideas I'll express in my life, but like it or not, you'll be there.

I hope to use the editorial on collapsars as the basis for a lecture I'm giving soon at the planetarium here. I'd also like to read it as one of the opening portions for a class on science fiction and fantasy I'll be helping to teach at San Diego State College this fall. I'll use it as a prime example of fact outstripping man's wildest attempts at fiction.

You helped to give us Heinlein, Asimov, Sturgeon, and countless others. I look where some of them have gone. You single-handedly restructured the face of science fiction. Your form enormous rejection letters [illegible] were almost as much fun as a sale. You gave us fine stories of your own, and many of your ideas came to us, very slightly modified, through other authors. Towards the present, I'm afraid, you seemed to be a cherished old stifling influence, and you attacked you with all the senseless bitterness that seems the curse of youth and change. And maybe we weren't entirely wrong.

But you were the finest, most dedicated editor science fiction has ever had. You were a giant. Analog has been a part of my life since 1965, when I purchased my first science fiction magazine.

And now you know the secrets, all the things you tried to discover in life. All the whys and wherefores. That's another reason for us, the upcoming generations, to be a little envious of you. But we've got to remember what Frost said,

The woods are lovely,
dark and deep.
But I have promises to keep,
And miles to go before I sleep.
And miles to go before I sleep.

Sleep well, John. You deserve a rest.

GREG BEAR
1861 El Jardin Court,
El Cajon, California 92020

Gentlemen:

The afternoon paper for Tuesday, July 13th, carried a one-column-inch announcement of John W. Campbell Jr.'s death.

There's a one-word description of such news: unbelievable.

That's about as far, descriptively, as one can go, too; there aren't any words to—there aren't any words.

From the standpoint of those of us—I've no doubt our name is legion—who followed Mr. Campbell's lead, encouraging the healthy progress of science fiction—as opposed to

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the lame, halt, blind and dumb crawl of certain bandwagon-jumping mainstream writers and editors, as well as the erotically-oriented mouthings of some "speculative" fictioneers—his death is a cataclysmic disaster.

From a less personal viewpoint, however, his death might perhaps be labeled "timely". Consider: he died on the upbeat; his personal force was still at its peak; as a science-fiction editor, he was a power to be reckoned with, not merely brushed off; in the past fifteen years, he reached—and remained at—the top of his form as an editorialist.

It is in this latter context that I, for one, shall miss him most.

Not "most deeply," "most poignantly," or "most everything". Just "most".

His was an unfettered personality—a unique point of view: always slanted a little from the two main, diametrically-opposed viewpoints, say, 21°, 13′, 2.5″ away from each.

The only good thing—if there *be* a "good" thing—one can say of Mr. Campbell's death is: in the memory of all of us—the readers, writers, editors, publishers, historians of science fiction—he'll stay a unique person, capable of controlled passion.

No fading away for John W. Campbell, Jr.—Thank God!—no mental deterioration, no senile fuzziness, no blurring of that compassionate desire to see, not only both sides of the coin, but the edge, as well.

Ever notice? His editorials were never altogether complete—the "last word"—he always left a little unsaid. Room for thought.

He died as he wrote; leaving a little—a *lot!*—unsaid—room for thought.

I read what I've written and it doesn't say a thing—just a bunch of letters strung together.

Like I said before—there aren't any words.

MAYDENE CROSBY
R.R. 3
Box 112
Lafayette, Indiana 47905

Gentlemen:

I knew John Campbell neither very well nor very long: my sole claims to acquaintance are an hour's conversation at Heicon '70—surely the last major con he attended—and the sale of one short story which has yet to appear in print. Yet, despite my limited knowledge of him, I feel his passing will have the sort of effect on science fiction that only the disappearance of a major figure could have, for in his time he laid his stamp upon the genre with such indelible firmness that one might say—nay, I *do* say—that he was more a part of science fiction than many a writer: he was a builder, and the self-built monuments to his life will endure for many, many years, in effect at least, if not in name.

Of course, he had his critics, some of them very bitter and voluble, but I have found from conversations lo-

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early that few in England—it appears—would deny that he will be hard to replace; for my own part I agree. The fashion in too many science fiction magazines seems to be to work through a list of editors at an appalling rate. In complete contrast to Astounding/Analog which has acquired an aura of permanence transcending all trials and tribulations—forty years of publication-plus is no mean feat.

ANDREW M. STEPHENSON
"Woodlands"
Isle Road, Maidenhead
Berkshire, England

Gentlemen:

I have been a reader of "Astounding/Analog" since 1938 and over the years I even secured and read all of the issues starting with the very first one.

Although I never met John personally, I corresponded with him on numerous occasions and found him always helpful and informative. This correspondence plus his editorials only served to convince me that he was a most remarkable, farseeing man, who widely deserves much credit for the present advanced state of the United States space program.

I believe that many of today's young readers are not aware that John was one of the best science-fiction writers of all time, often under the pen name of Don Stuart.

His novelette "Forgetfulness" is still one of the two or three best I've ever read—and I've read thousands. Although "Astounding-Analog" has never reprinted a story, I feel that, this time, an exception should be made, both as a tribute to John and—as he would have said—"because it's a damn good story"!

Check it out; "Forgetfulness" reads as well now as it did thirty years ago and it will show today's readers John's stature as a craftsman—a master of his genre.

MANFRED ZITZMAN
Assistant Professor of Chemistry
Albright College
Reading, Pa. 19604

Gentlemen:

It is rare that I write letters to editors or their publishers, but Mr. Campbell, as Editor of Analog, was one who achieved with me a friendship and respect he never received personally. I sincerely regret the privilege of meeting him never came my way.

For as long as I can recall—definitely antedating John Campbell's appointment as editor—I have read Analog, including years under its prior title. Others were good reading but none retained my interest, and respect, for Analog's quality. It has no competition, and I trust it will retain its stature.

In any event please keep Analog a credit to his work—let its outstanding quality continue as a monument to him.

E. LAWTON THURSTON, JR.
24 Hampton Avenue
Westmont, New Jersey 08108

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EDITORIAL

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petent defense attorneys could have had practically all of the evidence thrown out of court.

The one thing that Oswald might have been tried for successfully would have been the murder of the policeman he shot—the act that actually led to his arrest. The world wasn't very interested in the murder of the policeman; they wanted to know all about Kennedy's assassination.

Any effort to try Oswald for the murder of the President would probably have wound up being a fiasco—because the free press got, too freely, what it wanted.

The Supreme Court has not yet had the courage to lay down any sort of rules defining what the limitations on free speech and free press are; Justice Holmes's famous dictum that one doesn't have free speech to the extent of yelling "Fire! Fire!" in a crowded theater is about as far as that's been defined.

The FBI—and any crime-detection agency—must have a right of privacy. It's granted that a doctor, lawyer, or priest have a right of privacy in that they can gather information and refuse to reveal that information to anyone else. It's been recognized that the press reporter has a right to keep his sources of information confidential—and my, oh, my how the press howls when that right is even slightly, peripherally, threatened!

But the press is very loudly, and self-righteously proud of its feats in fencing stolen documents and publishing information gathered by the FBI and the Pentagon.

There's been a hoorah going on about the CBS news documentary "The Selling of the Pentagon," with CBS flatly refusing to provide the Congressional investigators with *all* the film they made in the process of making that news special.

Judging by the liberal press's attitude, the thing the Congressional committee should do is hire some expert burglars to break in and steal the CBS film records, or suborn some CBS employee to sneak it out to them.

It all boils down to a very old expression—one so old that the very words are obsolete today: "It depends on whose ox is gored."

Now if you hold a concept of Justice that basically comes down to "Justice is when things are done the way I think they should be done—the good, right, proper way!" you are in very serious trouble, but don't know it yet. Like a kid who's found that heroin makes life pleasurable, delightful, and exciting; he's already dead, but just doesn't realize it yet. The disease called heroin addiction, like cancer of the brain, has almost zero cure rate. Usually, survival is less than five years.

A concept of justice that is not based on fundamental rules of ethics, but on "what I think now is the

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way I want [illegible] er, that is, think it *ought* to be," is actually about as risky as playing catch with 80% dynamite.

The public does *not* have a right to know.

It's long been recognized that a man who acts as his own lawyer has a fool for a client. It takes years of specialized training to understand the implications, meanings, and effects of statements made in court; no ordinary man knows which end is up in that complex field of battle. It takes an expert to read the documents and know what they imply.

Anyone who goes in for reading his own symptoms and prescribing the necessary treatments is also a fool for any condition more serious than a stubbed toe. Doctors spend years learning how to interpret the data that the patient and the assorted instruments bring him.

A friend of mine some years ago went to an eye specialist; in the last week or so he'd had trouble focusing his left eye and was beginning to get headaches when he tried to read.

The doctor didn't fit him with new glasses; he sent him to a major hospital where, that afternoon, they gave him a dose of X rays so massive that it would have killed him within thirty days.

That kept him alive for almost another ten days, autopsy showed his brain cancer had already metastasized to more than one hundred twenty different locations throughout his body.

Want to try treating that headache with aspirin because it's just a minor nuisance?

The simple fact of the matter is that, given all available data, what an expert sees and what a nonexpert sees are apt to be totally different.

Try looking at an X-ray picture; it takes years of experience to recognize meaning in that foggy, blurry mass of blacks and grays—and on tough ones, even experts can only make an educated guess, with resultant disagreement of experts.

Incidentally, notice that expert information *gatherers* are by no means automatically expert information *interpreters*. For example, a top-notch CIA information gatherer has no need to be a senior statesman; it takes a lifetime to learn to be a competent international statesman, and it takes years to learn the trade of being an effective information gatherer. The two careers tend to be somewhat mutually exclusive.

Of course the press always wants to know what's going on undercover in Washington, or at the State capital, or in the DA's office—of course they're always prying and talking about the public's right to be informed.

Because the public is totally incompetent to evaluate the information involved in international affairs—precisely as incompetent as they are to correctly interpret a chest X ray—they not only do *not* have a right to be informed: *They must not*

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be informed fully. With the data available—that foggy picture of the political scene that's about as blurry and dull as a chest X ray—they'll almost certainly get the wrong answers.

Yes, and the experts get the wrong answers, too. But remember the Finagle's Law corollary that says, "No matter what happens, there's always somebody who predicted it," and will be exceedingly loudmouthed about it.

Then, too, any modern schoolboy is far wiser than Aristotle; he knows a lot of things that Aristotle couldn't figure out in his whole lifetime. There's nothing like 20-20 hindsight, but 20-20 foresight is against the law, you know. It's called fortune telling, and you get arrested for practicing it.

The hullabaloo over the Pentagon Papers stems about 95% from a bunch of annoyed liberal press people who wanted in, and weren't given all the inside scoop they wanted at the time—and now are pointing out that their 20-20 hindsight is inestimably superior to the foresight of Presidents and Cabinets. The fact that newspapers don't have any international responsibilities makes their judgments far clearer.

That isn't the terms in which anyone wants to be judged—it's the old, real-life variant on the ancient protest "*Now* you tell me!"

The principal problem of Justice involved, however, is the still completely unsettled problem of the right to secrecy vs. the right of a free press.

The fact is that a government *must* operate in secrecy, or it simply cannot operate. A doctor who was forced to turn tapes of all his patient interviews in to the local news editor would cease to be able to function. The press guards their right to keep their sources private most jealously; they feel secrecy is essential to their function. The privacy of the confessional was acknowledged millennia ago. Human life cannot continue without areas of privacy.

Would any ambassador of any other country consider discussion of possible actions, tentative plans, or potential trades if he knew that complete recordings would be made available to the press services?

The public has no more right to invade that governmental—*international governmental*—privacy than it does to invade the doctor's consulting room, the priest's confessional, or the individual's bedroom.

A lot of members of Congress—both Senate and House—have yowled loudly that they weren't fully informed of what was going on at the time.

Getting yourself elected to Congress does not make any miraculous instant transformation of a blabbermouth into a wise statesman. The human personality type that is most acutely driven to find out about everything that's going on—particularly things marked "secret" by

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someone else" is the human personality type that most enjoys proving their "insider" status by talking about what they know. This is what makes a news reporter: he pries out the clues and rushes to get them into print—only the senior reporters have the wisdom and restraint to hold the information to himself till the story matures—and the rest of the data comes in.

The same type of personality can be found in political life—and that is the reason why Congress and the Senate can *not* be taken in on all the negotiations and cogitations of the government.

Many of the governmental secrets are not *our* government's secrets to share. During WWII—which can, now, be discussed and considered somewhat more objectively than can the Vietnam problem—you can safely bet that President Roosevelt and his Cabinet and senior military advisers had been pretty fully informed as to the military position of England in 1940 before we got into the war. Undoubtedly the British had "in confidence" supplied our leaders with information that would allow our government to understand what their real and present dangers were.

That information would have been of immense value to Herr Hitler.

Did our government have any ethical right to inform our Congress and Senate of the information Churchill and his advisers had given them?

Remember that such information could have been used to great personal political advantage by a lot of Congressmen and Senators who were strongly opposed to Roosevelt and his policies. That there were Congressmen and Senators at the time who were anglophobic, and sincerely hoped Hitler would conquer England. That, inevitably, a certain proportion of members of Congress were weak men, blundering small-town men incapable of world statesmanship, men too anxious to be "in on the secret" *publicly*—which can be demonstrated only by spilling the secret—to be trusted with vital information.

If the President informs only a "trusted few" of the leaders of Congress, he is immediately subject to accusations of favoritism, and of political bias. Obviously, he can better trust Senators who agree with his policies, and don't seek his political injury than he can someone who wants nothing so much as to ruin him. This means he will select as the "chosen few" members of his own party, plus a few members of the other party who agree with his viewpoint. And that proves it's really political cliquism at work.

The problems of secrecy, privacy, and the rights of a free press are *not* simple.

Almost precisely the same complex problems exist in the field of the right/duty of the FBI to gather information. The FBI is the national de-

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tective agency; its duty is to gather information to solve *and to prevent* crimes. Remember the FBI and the Secret Service came in for a lot of criticism when President Kennedy was shot: they hadn't guarded him adequately. They *had* carefully spotted the known violent extremists, crackpots, and potential homicidals, and arranged to keep them under surveillance. The trouble was that Oswald was an unknown; they hadn't gathered enough data about him to recognize the potential for murder in him.

Obviously, to protect the President, and the Nation, the FBI *must* gather data concerning so-far-blameless individuals who have a potential for violent crime.

It's true that their data covers people who have committed no crimes, and don't plan to--but most people ,who commit emotional crimes don't intend to, remember. They don't plan it months or weeks in advance.

The quite effective work that has been done on stopping airplane hijacks in this country depends on spotting personality types that are potential hijackers, and reacting to such people *before* they board the plane. The air marshals on board are a last desperate line of defense; the real line of defense is secret information about individuals who have never hijacked a plane before, and against whom there is no evidence any court of law would consider.

Just as an example of the right of privacy vs. the right to invade privacy:

Some years ago an insurance company was asked to provide a surety bond on a young executive of a large corporation. Since he'd be in the treasurer's office, the bond was to cover the company, in case of his malfeasance, to $500,000. The insurance company naturally had their agents investigate the young man's background. They found his record completely satisfactory, but . . . they also found that the man's wife had served a three-year term for embezzlement, and that her ex-partner was still finishing off the rest of his term. All evidence indicated that the young executive had no idea of his wife's criminal past.

This makes a nice question of ethics and secrecy. If the insurance company refused to give the bond, it would end the young man's career; certainly there would be a demand that reasons for the refusal be given. If the facts were stated, it would probably break up the young man's marriage. The woman in the case *might* be completely reformed, and not constitute any danger of misleading her husband.

Should the insurance company get off the hook by leaking the information to an eager-beaver scandal sheet news reporter?

Figure out a good answer to that one, while you're deciding whether the joker that stole the FBI reports files was such a wise and noble creature. ■ *THE EDITOR*

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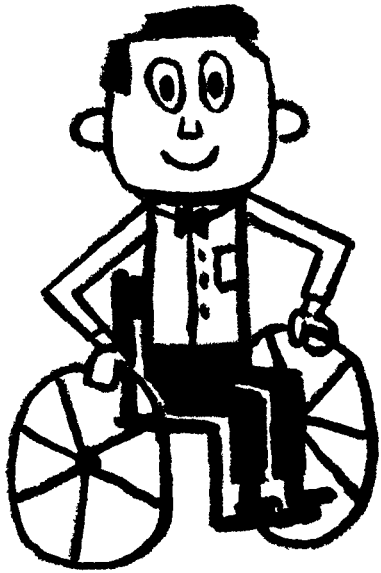

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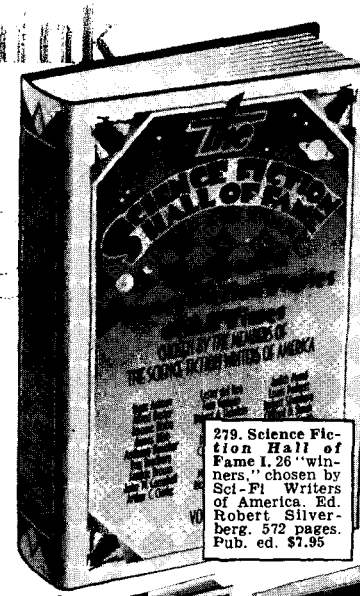

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